CHAPTER 4
ENVIRONMENTAL EFFECTS

This chapter describes the potential environmental effects, or impacts, of Tucson Electric Power Company (TEP) constructing the proposed project in one of its three proposed transmission corridors, and also describes the No Action Alternative. The Council on Environmental Quality's (CEQ's) regulations require that an Environmental Impact Statement (EIS) contain a description of the environmental effects (both positive and negative) of the proposed alternatives. CEQ's regulations (40 CFR 1508.8) distinguish between direct and indirect effects. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by the action that occur later in time or farther in distance. Both direct and indirect effects are addressed in this chapter.

CEQ's regulations also require that an EIS contain a description of the cumulative impacts (40 CFR 1508.7) of the proposed alternatives. CEQ's regulations define cumulative impacts as those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts are addressed in Chapter 5 of this Draft EIS.

As discussed in Chapter 3, many people have a holistic concern for the natural beauty, undisturbed landscape features, abundant plant and animal wildlife, and cultural resources that contribute to the "sense of place" along portions of the alternative transmission corridors. Clearly, the natural and cultural characteristics that contribute to this sense of place transcend the consideration of individual resource areas in a NEPA document. However, in order to analyze potential impacts effectively and document the analysis, it is necessary to consider the resource areas individually. Thus, the discussion of potential impacts in this chapter is divided into distinct resource areas.

This chapter presents information on the potential environmental effects on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations. Note that impact discussions for the Central and Crossover Corridors are based on detailed analysis of Option 1, the sub-route that avoids the Inventoried Roadless Area in the Coronado National Forest. However, for most resource areas (visual resources, socioeconomics, water resources, air quality, noise, human health, infrastructure, and environmental justice), no potential for differences in impacts between Options 1 and 2 has been identified. Differences between the sub-routes are discussed for those resource areas where there is a potential for meaningful differences in impacts.

4.1 LAND USE AND RECREATION

This section discusses the potential effects of the proposed project on land use and recreation in the project vicinity. The methodology for determining impacts is presented, along with a description of the impacts for each alternative.

4.1.1 Land Use

Methodology

The land use resource impact analysis consists of an evaluation of the effects caused by the construction and operation of the proposed alternatives on specific land use resources and recreational resources within the vicinity of the project. Impacts to land use are determined relative to the context of the affected environment for each alternative described in Section 3.1.

To determine if an action may cause a significant impact, both the land area displaced by the transmission line right-of-way (ROW) and the compatibility of transmission line ROW with land use plans are considered. Land use impacts associated with construction of new access roads and improvement to existing roads are described in Section 4.12, Transportation. The context for the project is the area along each corridor from Sahuarita to Nogales, continuing south to the international border. Special consideration is given to any unique characteristics of the area (for example, recreational opportunities or resource conservation zones), and the degree to which the project may adversely affect such unique resources. The land use evaluation includes both temporary land use impacts during construction and permanent changes to land use resources.

Impacts Common to the Western, Central and Crossover Corridors

The following potential land use impacts are common to all three proposed corridors. The existing TEP South Substation in Sahuarita, located as shown in Figure 1.1–4, would be upgraded and expanded approximately 100 ft (30 m) beyond the existing fenceline, impacting an area of an estimated 1.3 acres (0.53 ha). A new Gateway Substation, with a total graded area of approximately 18 acres (7.3 ha) would be constructed west of Nogales, Arizona, located as shown in Figure 1.1–4. For the Gateway and South Substations, the equipment area would be fenced with a locked gate, and the area outside the fence would be revegetated with native plants following construction. The existing gravel parking area at the South Substation, and a new gravel parking area at the Gateway Substation, would serve as the construction staging areas (TEP 2001). In addition, one estimated 0.5-acre (0.2-ha) fiber-optic regeneration site would be required, which would be placed on private land in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita, for any proposed corridor. A temporary construction laydown yard of approximately 80 acres (32 ha) would be sited near the Arivaca Road and Interstate 19 (I-19) interchange on previously disturbed land, and three temporary 3-acre (1.2-ha) staging areas would also be required, as described in Section 2.2.3, Transmission Line Construction. Temporary line tensioning and pulling sites ranging from 0.5 to 1.5 acres (0.2 to 0.6 ha) would also be required along the corridor, as described in Sections 2.1.1 through 2.1.3 for each corridor.

The proposed project would utilize primarily self-weathering steel tubular monopoles, depicted in Figure 1.1–3. Dulled, galvanized steel lattice tower structures, depicted in Figure 1.1–4, would be used in specific locations for engineering reasons to minimize overall environmental impacts (for example, to soils or archeological sites), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2002) (as explained in Section 2.2.3). Monopoles occupy less acreage at the foundation than lattice towers. However, the typical span between lattice tower structures is 1,000 to 1,200 ft (305 to 355 m), compared to 800 to 900 ft (244 to 275 m) between monopoles, thus requiring fewer lattice tower structures to support a given distance of transmission line route. For the proposed project, the distance between transmission line structures would be between 600 and 1,200 ft (183 and 366 m), with spans generally shorter at the substations and interconnection points. Three slight variations of the monopole (the tangent structure, the turning structure, and the dead-end structure) that are visually very similar to the monopole in Figure 1.1–1 would be used at various points along the route based on the turning angle of the transmission line and the elevation change between towers. Likewise, a slight variation of the lattice tower structure (the turning structure) that is visually similar to Figure 1.1–4 would be used at various points along the corridor.

The final footprint (area beneath each tower) of each monopole is 25 ft^2 (2.3 m^2); the final footprint of each lattice tower is approximately 3,600 ft^2 (334 m^2). The tower construction site required for each monopole is an approximately 100 ft (30 m)-radius circle, and for each lattice structure is a 200 by 400 ft (61 by 122 m) area, more than double the construction area required for monopoles. Assuming that primarily monopoles are used, the approximate number of structures and land displaced by structures and structure construction sites has been estimated for each proposed corridor. These estimates, listed in Table

4.1–1, are broken down to distinguish land use impacts on the Coronado National Forest and Federal lands managed by the Bureau of Land Management (BLM) separately, and are described in the text for each corridor. In addition to the area disturbed by the footprint of the tower structures, the area to be disturbed by access roads, transmission line tensioning and pulling sites, fiber-optic splicing sites, and laydown yards is addressed separately in Section 4.12, Transportation, and is not reflected in the structure site disturbance estimates in Table 4.1–1.

Table 4.1–1. Approximate Structure Land Use.[a]

	Number of Structures	Structure Construction Site Area (acres)	Final Structure Footprint Area (acres)
For Entire Corridor			
Western Corridor	429	309	0.25
Central Corridor	373	269	0.21
Crossover Corridor	431	311	0.25
On the Coronado National Forest			
Western Corridor	191	138	0.11
Central Corridor	102	74	0.06
Crossover Corridor	196	141	0.11
On BLM Land			
Western, Central, and Crossover Corridors	8	5	0.004
Non-Federal Land			
115-kV Interconnection	20	14	0.012

[a] Land use area does not include structure access roads. See Section 4.12, Transportation.

Northern Portion. Several areas along the common northern area of all three corridors have unique designations in local land use plans. The Pima County Comprehensive Plan (Pima 2003) indicates a Resource Productive Zone intermixed with Low Intensity Rural in the area west of I-19 near Sahuarita. Resource Productive Zones designate cultivated ranching and mining lands for their productive capabilities. Approximately 6 mi (10 km) north of Arivaca Road, the corridors cross a Resource Conservation Zone designed to protect open land space for environmental quality, public safety, recreation, and cultural heritage. Given the limited area of land to be used by the proposed project, the proposed project would not be expected to interfere with these unique land uses.

The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O'Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation.

The BLM lands crossed by the proposed project are designated as disposal land under the current Resource Management Plan. The land crossed by the proposed project would need to be redesignated to a utility corridor as described in Section 1.2.2, Federal Agencies' Purpose and Need and Authorizing Actions. TEP applied to BLM for ROW rights on an estimated 19 acres (7.7 ha) of land. This ROW would run immediately adjacent and parallel to existing transmission lines as described in Section 3.11, Infrastructure.

State Trust Lands. Each of the corridors would have some degree of impact on trust land. The following information was provided by the Arizona State Land Department:

> The central alignment would have the greatest impact on the monetary value/income producing ability of the trust land. This is the land closer to the highway, portions of which are anticipated

to be developed in the foreseeable future. However, the Western and Crossover Corridors cross approximately five miles of trust land and the Central Corridor crosses approximately 6.5 mi (10.5 km) of trust land in the Tinaja Hills area (Pima County) identified as "conservation option lands" under the proposed State Trust Land Reform package that is currently under consideration by the Arizona legislature. A goal of the State Trust Land Reform package is to improve management and planning of trust lands and to conserve significant lands.

There are a number of existing leases within the three alternative corridors. Most of them are grazing leases and the transmission corridor should be able to co-exist with these without any major impacts. Minor accommodations for fencing, ranch roads, water facilities and similar grazing improvements may need to be considered during the implementation phase of the project.

The Arizona State Land Department currently leases approximately 4,500 acres (1,821 ha) of land to Caterpillar Corporation for use as proving grounds and training. The majority of the buildings and other significant improvements are on Caterpillar-owned land. The leased land is utilized in conjunction with the Caterpillar-owned land for testing and demonstration purposes. This lease could be jeopardized if the power lines create a physical restriction/constraint on the use of the facility or if the aesthetic view corridor Caterpillar uses as a backdrop for its facility were to be severely impacted by the power lines. In either case, the income producing ability of the lease would be jeopardized, as well as the significant financial benefit to the local community.

As discussed in the Comment Response Document (Volume II of this EIS), the Federal agencies have not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

Coronado National Forest. TEP has not finalized the precise placement of the 125-ft (38-m) ROW within the 0.25 mi (0.40 km)-wide study corridors. These sitings would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed. TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori Ecosystem Management Area (EMA) (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area.

The total new area of land (currently undisturbed) on the Coronado National Forest that would be temporarily disturbed during construction activities would be as follows: 197 acres (79.8 ha) for the Western Corridor, 105 acres (42.5 ha) for the Central Corridor (options 1 and 2), and 238 acres (96.4 ha) for the Crossover Corridor (options 1 and 2). In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. The permanent area to be disturbed by the proposed project would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Western Corridor, the permanent area disturbed would be an estimated 29.3 acres (11.9 ha). For the Central Corridor (options 1 and 2), the permanent area disturbed would be an estimated 23.1 acres (9.3 ha). For the Crossover Corridor (options 1 and 2) , the permanent area disturbed would be an estimated 36.4 acres (14.7 ha). The roads that would remain open for use by TEP (administratively controlled special use roads) following construction would be administratively closed (URS 2003a).

A large portion of the Tumacacori EMA (approximately 164,000 acres [66,400 ha]) is classified by the Forest Service (USFS) as able to support livestock grazing, some of which is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition, a measure of the

health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. Both short-term and long-term effects could occur to livestock grazing from the proposed project. In the short-term, the operations of permittees could be disrupted by construction equipment and activities. In the long-term, the forage base on livestock lands would be reduced by up to an estimated 0.11 acres (0.04 ha) occupied by support structure bases, plus land converted to access roads. New traffic and human use patterns could also cause disturbance to grazing operations.

The lands traversed by the proposed transmission line are typified by low fire occurrence from natural ignition sources. Human-caused fires occur at a more frequent rate in the area immediately west of Nogales, Arizona, and south of the Ruby Road (State Highway 289).

Impacts to the power line from natural fires are expected to be minimal. This assessment is based on several factors. The first issue of consideration is the low frequency of natural ignitions. The second factor is that the primary carrier fuel is grass which would result in low to moderate flame heights. A rapid dispersal of smoke could also be expected since there would be minimal smoldering of material after the passage of the fire front. Natural ignitions (lightning) are also frequently associated with light to moderate rainfall which would also temper the impacts from this source.

Human-caused fires in the Nogales area and other areas of public travel are of somewhat greater concern because of the increased number of starts and the fact that these ignitions occur without the benefit of rainfall. Because grass is the primary carrier fuel, significant impacts are not expected to the proposal.

Although heat from natural and human-caused fires is not anticipated to be an impact to the transmission corridor, smoke from a fire as small as several acres could generate enough concern to cause arcing problems. Smoke from wildfires is known to cause arcing if it becomes dense enough. This creates a significant hazard to firefighters attempting to suppress the fire. There is also a potential risk to the power line itself and adjacent structures. During the summer of 2004, power lines of a similar nature to the proposal were shut down while crews conducted burnout operations on the Willow Fire north of Phoenix, Arizona. During the same time period, a power line crossing the Coconino National Forest was also shut down for a brief period while crews completed burnout operations along the power line ROW. Similar shutdowns could be expected for transmission lines associated with the TEP proposal.

At the present time, the majority of the power line proposal lies in areas where we are not likely to conduct prescribed burning. The USFS has not identified the area associated with the power line as needing immediate fuels treatment. One exception would be the area associated with Potrero Canyon in the vicinity of the Gateway Substation. This area is currently being treated as a Wildland Urban Interface area with values at risk relating to the adjacent private land subdivisions. The initial fuels reduction treatment in this area is scheduled for completion in 2005. Future treatment options will be necessary to further reduce the risk to private land development and the planned power line and substation.

Nogales Border Area. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003). Thus, TEP would not construct project structures that could limit access to the international boundary monuments and markers. Section 3.1, Land Use, describes U.S. Border Patrol activities in the vicinity of the U.S.-Mexico border near the proposed project. U.S. Department of Energy (DOE) has contacted the U.S. Border Patrol regarding potential impacts to ongoing activities in the vicinity of the U.S.-Mexico border. A copy of DOE's consultation letter and U.S. Border Patrol response are included in Appendix A. The Border Patrol indicated that they expect an increase in the amount of patrol operations that would occur in the area. There are plans to

expand the current Remote Video Surveillance System (RVSS), consisting of 60 to 80 ft high towers, to the west of Nogales and onto the Coronado National Forest.

In the U.S.-Mexico border area, construction activities would be coordinated with the appropriate agencies on each side of the border. At a minimum, TEP expects the U.S. Border Patrol to be included. TEP anticipates that this effort would be coordinated with the Mexican proponent for the project, and does not anticipate any ground disturbing activities within the reserved strip of land (a total of 120 ft [36.6 m]) along the international border. The preliminary design of the project has the last U.S. pole on top of a hill and the first pole on the Mexico side also on top of a hill to adequately span the border (TEP 2003).

Impacts to specific land uses within the corridor would be mitigated by the precise siting of the ROW. Since the length of the ROW for this project would not be fenced or otherwise separated from adjacent lands, except as required by land owners and managers, and primarily monopoles would be used, the land area affected by the ROW would be minimized. Access roads, as discussed in Section 4.12, Transportation, would need to be constructed, and certain access roads would remain for ongoing access by TEP. The long-term impacts of access roads would be to increase the acreage of the affected lands, and create the potential for biological impacts, such as the distribution of noxious weeds, and other soil, water, recreation, and visual impacts (URS 2003b), as summarized for each resource area within this EIS.

During construction, temporary impacts to land uses within the ROW may occur due to movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow on local roads, may also temporarily affect residents, recreationalists, and farmers in the area immediately adjacent to the ROW. Coordination among TEP, its contractors, and landowners and managers regarding access to the ROW and construction scheduling would minimize any such disruptions.

4.1.1.1 *Western Corridor*

For the Western Corridor, there would be an estimated 429 support structures, with 191 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be approximately 309 acres (125 ha) for the entire Western Corridor, 138 acres (56 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Western Corridor, 0.11 acres (0.04 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The section of the Western Corridor that joins the El Paso Natural Gas Company (EPNG) pipeline ROW and exits the Coronado National Forest an estimated 2 mi (3.2 km) to the southeast is within an existing Forest Transportation System and Utilities Corridor. Portions of the Western Corridor crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.1. The Western Corridor would not pass through any IRAs.

4.1.1.2 *Central Corridor*

For the Central Corridor, there would be an estimated 373 support structures, with 102 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 269 acres (109 ha) for the entire Central Corridor, 74 acres (30 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.21 acres (0.09 ha) for the entire

Central Corridor, 0.06 acres (0.02 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land. Table 4.1–1 shows that the Central Corridor displaces less land than the other alternatives for the transmission line structures.

Under Option 1, where the Central Corridor deviates from the EPNG pipeline ROW to avoid an IRA for approximately 1.9 mi (3.1 km), the Central Corridor is not within an existing Forest Transportation System and Utilities Corridor. Portions of the Central Corridor Option 1 crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.2. With respect to Central Corridor Option 2, the Forest Plan would be amended to establish utility corridor width and change visual quality objectives as fully described in Section 2.1.2.

4.1.1.3 *Crossover Corridor*

For the Crossover Corridor, there would be approximately 431 support structures, with 196 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 311 acres (126 ha) for the entire Crossover Corridor, 141 acres (57 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Crossover Corridor, 0.11 acres (0.05 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The Crossover Corridor is not within an existing Forest Transportation System and Utilities Corridor, except where it follows or crosses the EPNG pipeline ROW. Portions of the Crossover Corridor Options 1 and 2 crossing the Coronado National Forest are not consistent with management direction in the governing Forest Plan. The Forest Plan would be amended to establish a new utility corridor, establish utility corridor width, and change visual quality objectives as fully described in Section 2.1.3. The Crossover Corridor would pass through approximately 3 mi (4.8 km) of an IRA in Peck Canyon, as shown in Figure 3.1-1, and approximately 1.9 mi (3.1 km) of an IRA under Option 2.

4.1.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The majority of the land crossed by the proposed 115-kV interconnection route is planned by Arizona Department of Transportation (ADOT) as a transportation corridor and zoned as Light Industrial or General Commercial. The proposed corridor parallels the southern border of land designated as Residential Cluster (zoned Motor Home Residential) for approximately 0.25 mile (0.4 km). Planning is currently underway for a commercial center to be located in this area, southwest of Valencia Substation. There is currently no development in that portion of the land crossed by the proposed route. Construction of the transmission line would avoid direct conflicts with residential, educational facilities, houses of worship, and other potentially sensitive land uses. It is anticipated that the proposed 115-kV transmission line interconnection would have minimal impacts on existing land uses. Approximately 4.3 acres (1.7 ha) of non-Federal land would be disturbed during construction for the 20 support structures associated with this 3.0 mi (4.8 km) transmission line segment.

4.1.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission lines and the associated facilities as proposed in this EIS. There would be no land use impacts associated with the No Action Alternative. Current land use trends would be expected to continue in accordance with local land use plans.

4.1.2 Recreation

As discussed in Sect. 3.1.2, the USFS Recreation Opportunity Spectrum (ROS) evaluation methodology (USFS 1990) was used to generally assess the potential for the TEP project to impact recreational opportunities both on and off the Coronado National Forest. The USFS employs the ROS methodology to evaluate the nature and significance of potential impacts to recreation settings. Maintaining a broad spectrum of ROS classes is essential to the management of National Forest System lands, as it affords users a wide variety of choices. The ROS includes matrices that establish the limit of acceptable changes in the following setting indicators—access, remoteness, naturalness, facilities and site management, social encounters, visitor impacts, and visitor management (see Text Box below)—for each ROS classification (see Sect. 3.1.2 and Figure 3.1-2).

Compatibility of Changes in Setting Indicators with ROS Area Classifications*

Each setting indicator has a matrix, such as the one shown in Table 4.1–2, which establishes conditions that are fully compatible, normal, inconsistent, or unacceptable within a given ROS area classification. These terms are defined as follows:

- **Fully Compatible** - conditions that meet or exceed expectations within an ROS area classification.
- **Normal** - normal conditions found within the recreation setting.
- **Inconsistent** - conditions that are not generally compatible with the norm, but may be necessary under some circumstances or to meet management objectives.
- **Unacceptable** - conditions that, under any circumstance, do not fall within the maintenance of a given class. When unacceptable conditions for one or more of the 7 setting indicators are unavoidable, an analysis is necessary to determine whether the overall recreation setting has been altered to the point of changing to another ROS classification.

*A change in ROS setting does not necessarily require a Forest Plan amendment.

Source: USFS 1990.

Table 4.1-2 provides an example of how such a matrix is used to evaluate changes in an ROS setting indicator; this matrix is for Facilities and Site Management. The matrix illustrates that, in the Semi-Primitive Non-Motorized ROS class (see Sect. 3.1.2 for class definitions), the setting of 'no facilities for user comfort and rustic and rudimentary ones for site protection only' is *fully compatible*, 'rustic and rudimentary facilities primarily for site protection and no evidence of synthetic materials' is *normal*, 'rustic facilities providing some comfort for the user as well as site protection and refined native materials' is *inconsistent*, and 'facilities designed for user comfort and convenience and synthetic materials' is *unacceptable*.

Recreational activities, such as biking, birding, hiking, photography, rock climbing, horseback riding and off-vehicle highway use, would be directly impacted by the construction and presence of transmission lines in areas common to all corridors. The most obvious impact to each of these recreation activities would be a change in the visual setting (see Section 4.2) of the recreational area. Other potential impacts to specific activities would result indirectly from decreased opportunities to observe birds and other wildlife of interest (see Section 4.3).

Sources of impacts would include the physical presence of the transmission line structures, which would impact the remoteness and naturalness of the area; the permanent closure of construction access and maintenance roads to vehicles or other public uses, and the increased use of transmission line corridors by illegal immigrants and the U.S. Border Patrol. The following sections describe the effects of the TEP project on ROS setting indicators and the compatibility of that change with the ROS classes affected in each transmission line corridor and the 115-kV interconnection.

Table 4.1–2. Example of ROS Indicator Matrix for Facilities and Site Management

	No facilities for user comfort. Rustic and rudimentary ones for site protection only.	Rustic and rudimentary facilities primarily for site protection. No evidence of synthetic materials.	Rustic facilities providing some comfort for the user as well as site protection. Synthetic materials should not be evident.	Some facilities designed for user comfort and convenience. Some synthetic but harmonious materials.	Facilities mostly designed for comfort and convenience. Synthetic materials are commonly used.
Primitive	Normal	Inconsistent			
Semi-Primitive Non Motorized	Fully Compatible	Normal	Inconsistent	Unacceptable	
Semi-Primitive Motorized			Inconsistent		
Roaded Modified				Inconsistent	
Roaded Natural				Inconsistent	
Rural					Inconsistent
Urban					Normal

The degree of user access to recreational areas would be changed by the project because of the closure of some roads and the new construction of others. As described in Sections 3.12 and 4.12, both classified and unclassified roads are present along each corridor. Newly constructed access roads for the project are proposed to consist of spur roads from existing roads and would range from 500 to 1,000 ft (152 to 305 m) in length for each segment. Following construction of transmission lines, roads to fiber-optic splicing sites would be administratively closed by installing bollards, heavy pipe posts with a locked gate or chain, or a locked pipe barricade. All other roads not required by TEP for future maintenance would be impassable because of the placement of boulders, natural impediments, or trenches across the path to ensure long-term closure. Closed roads would be planted with native vegetation (at a minimum at the beginning segment visible from connecting roads) to effectively obscure all signs of the former roadway.

4.1.2.1 *Western Corridor*

This section describes the potential impacts of placing the transmission line in the Western Corridor on recreational resources, within the framework of the ROS setting indicators.

Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–3. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, for which the proposed project would result in changes inconsistent with the current ROS classification.

Roaded Modified Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–4. This table shows that the predicted setting indicator impacts for Remoteness are inconsistent with the current Roaded Modified Area classification. The Facilities and Site Management and Naturalness impacts from the proposed project would be unacceptable within the current Roaded Modified classification.

Table 4.1–3. Impacts to Setting Indicators in the *Roaded Natural* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Project towers, transmission lines, and roads would impact Scenic Integrity.	Yes (Normal)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–4. Impacts to Setting Indicators in the *Roaded Modified* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would be evidence of human activity where visible between Ruby Road and the Pajarita Wilderness, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from high to very low where visible along Ruby Road.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Minor increase based on limited new roads for recreationalists.	Yes (Normal)
Visitor Impacts	Impacts or visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Motorized Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–5. This table shows that the predicted setting indicator impacts for Remoteness and Naturalness are inconsistent with the current Semi-Primitive Motorized Area classification. Retaining access roads in addition to those leading to fiber-optic splicing sites would be unacceptable with Naturalness. The Facilities and Site Management impacts are unacceptable within the current classification of the area.

Table 4.1–5. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Western Corridor

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity in the immediate area of some recreationalists, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from very high to moderate and low with minimum access roads, or to moderate, low, and very low with full access roads.	No (Inconsistent) for limited access, No (Unacceptable) for full access
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	May slightly increase along tower access roads.	Yes (Normal)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Non-Motorized Area. The Western Corridor passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Because Semi-Primitive Non-Motorized areas are usually at least 0.5 mile (0.8 km) away from all roads, potential impacts were analyzed. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–6. This table shows that the predicted setting indicator impact for Remoteness is inconsistent with the current Semi-Primitive Non-Motorized Area classification.

4.1.2.2 *Central Corridor*

This section describes the potential impacts of the Central Corridor on recreational resources, within the framework of the ROS setting indicators. As evidenced in the analysis below, the ROS impacts of the Central Corridor are reduced because of the existing access to the EPNG pipeline ROW that provides access to the Central Corridor, thus limiting the need for new project access. For each ROS setting, the potential impact to the setting indicators and recreational uses are described below:

Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–7. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project, and Naturalness, which would have unacceptable changes introduced by the proposed project.

Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–8. This table shows that the predicted setting indicator impacts are compatible with the Semi-Primitive Motorized Area classification, except for Remoteness and Naturalness, which would have changes that are inconsistent, and Facilities and Site Management, which would have unacceptable changes introduced by the proposed project.

Table 4.1–6. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class Area ¼ Mile from the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Compatibility with ROS Class?
Access	Construction and maintenance roads to support towers within 0.5 mi of the SPNM Area could increase foot traffic off the roads into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	Yes (No change)
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	Yes (No change)
Social Encounters	May slightly increase to the extent that increased footpaths develop into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from occasionally used footpaths in the SPNM Area.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–7. Impacts to Setting Indicators in the *Roaded Natural* ROS Class in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Efect on ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Would change to very low at the Ruby Road crossing.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Semi-Primitive Non-Motorized Area. The Central Corridor (Option 1) passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Because Semi-Primitive Non-Motorized areas are intended to be located at least 0.5 mi (0.8 km) away from all roads, potential impacts were analyzed. The potential

impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–9. This table shows that all of the predicted setting indicator impacts are compatible with the Semi-Primitive Non-Motorized Area classification, except for Remoteness, which would have changes introduced by the proposed project that are inconsistent with the current area classification. Option 2 would have similar impacts to Option 1.

Table 4.1–8. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate and low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	Yes (No change)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–9. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class ¼ Mile From the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Compatibility with ROS Class?
Access	Given existing access to the pipeline ROW, few new project access roads would be needed in the brief section within 0.5 mi of the SPNM Area, resulting in few new foot trails into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	Yes (No change)
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	Yes (No change)
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from limited new footpaths into the SPNM Area.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

4.1.2.3 *Crossover Corridor*

This section describes the potential impacts of the Crossover Corridor on recreational resources, within the framework of the ROS setting indicators. Options 1 and 2 would have similar impacts. For each ROS setting, the potential impact to the setting indicators and recreational uses as follows:

Roaded Natural Area. The impacts of the Crossover Corridor on setting indicators upon crossing Ruby Road through the Roaded Natural Area would be the same as described above for the Central Corridor's crossing of Ruby Road. Table 4.1–7 shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project and Naturalness which would have unacceptable changes introduced by the proposed project.

Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–10. The predicted setting indicator impacts for Remoteness and Naturalness are inconsistent, and the impacts for Facilities and Site Management are unacceptable within the current Semi-Primitive Motorized Area classification.

Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–11. This table shows that the predicted setting indicator impacts for Remoteness, Naturalness, and Facilities and Site Management are unacceptable for the current Semi-Primitive Non-Motorized Area classification.

Table 4.1–10. Impacts to Setting Indicators in the *Semi-Primitive Motorized* ROS Class in the Crossover Corridor

ROS Setting Indicator	Impact of the Crossover Corridor	Compatibility with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate to low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	Yes (No change)
Visitor Impacts	Impacts of visitor use would not change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

Definitions of compatibility are in the text box in Section 4.1.2.

Table 4.1–11. Impacts to Setting Indicators in the *Semi-Primitive Non-Motorized* ROS Class in the Crossover Corridor

ROS Setting Indicator	Impact of the Crossover Corridor	Compatibility with ROS Class?
Access	Helicopter access would be used.	Yes (No change)
Remoteness	Would introduce nearby sights and occasional sounds (maintenance crews) of human activity in and around Peck Canyon.	No (Unacceptable)
Naturalness	Would decrease from very high to very low.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No change.	Yes (No change)
Visitor Management	No additional visitor management would occur.	Yes (No change)

SPNM = Semi-Primitive Non-Motorized.
Definitions of compatibility are in the text box in Section 4.1.2.

4.1.2.4 *ROS Impacts Summary for Western, Central, and Crossover Corridors*

Table 4.1–12 shows that the presence of the proposed transmission line would affect one or more ROS setting indicators on each of the alternative corridors.

With respect to the Access, Social Encounters, Visitor Impacts, and Visitor Management setting indicators, there would be no inconsistent or unacceptable effects from the presence of the transmission line. Because permanent access roads constructed for the project would be gated or otherwise blocked so they are not open for public use, recreational access to the area, and associated social encounters and impacts from visitors would not be significantly affected by the proposed project, and additional visitor management would not be necessary.

With respect to Naturalness, Remoteness, and Facilities and Site Management setting indicators, at least one aspect of the transmission line would have either an *inconsistent* or *unacceptable* effect in every corridor. An estimate of the degree of potential impacts to recreation could be inferred based on the total miles that each corridor affects on the Coronado National Forest: Western Corridor: 30.0 mi (48.2 km), Central Corridor: 15.1 mi (24.3 km), Crossover Corridor: 29.7 mi (47.8 km). To illustrate,

- the Western Corridor would have an unacceptable impact on Naturalness where it runs adjacent to Ruby Road for an estimated 6 mi (10 km) southwest of the Atascosa Mountains. Naturalness would become very low in this section of the Western Corridor.

- the Crossover Corridor would have a higher impact on Remoteness than the other alternatives, as an estimated 3.3 mi (5.3 km) of the Crossover Corridor at Peck Canyon would have unacceptable impacts on Remoteness. The Crossover Corridor would also have unacceptable impacts on Naturalness within Peck Canyon, and for a brief stretch as it crosses Ruby Road then continues over nearby ridgetops.

- the Central Corridor would have unacceptable impacts on Naturalness where it crosses Ruby Road, in the same location as the Crossover Corridor.

The ROS methodology, however, does not establish a specific number of setting indicators that are allowed to be rated as *inconsistent* or *unacceptable* before a change in an area's ROS classification is necessary. Rather, the USFS bases its conclusions on the significance of effects on a recreational experience on qualitative factors and professional judgment. Although the proposed action would introduce inconsistent or unacceptable changes in one or more setting indicators from an ROS perspective, the overall compatibility of the transmission line within each ROS class must be considered. In this context, the overall character of the recreational experience within the ROS classes of most of the National Forest System lands affected by the transmission lines would not be impacted to the extent that a change in ROS classification would be necessary. As an example, for the Western Corridor, although the TEP project would cause *inconsistent* and *unacceptable* changes in the Remoteness, Naturalness, Facities and Site Management setting indicators for the Semi-Primitive Motorized ROS area classification, these changes would not, in themselves, require a change in the ROS area classification upward to the Roaded Natural classification. The only ROS classification for which there is any possibility of a necessary change is the Semi-Primitive Non-Motorized (SPNM) area within the Crossover Corridor. A change in ROS classification of the area may be needed if any access roads remain in this area following line construction (either permanent roads or temporary construction roads that cannot be fully naturalized); this setting would likely require a change of the ROS classification from SPNM to Semi-Primitive Motorized.

The Central Corridor would have the least impact on ROS settings of the three corridors, because it crosses the least distance on National Forest System lands used for recreational purposes.

4.1.2.5 *115-kV Interconnection of the Gateway and Valencia Substations*

There are no state parks, national parks, or national monuments in the vicinity of the proposed interconnection project area, thus, the potential impacts to recreational resources would be minimal. Although the Sergeant Manuel Tapia Recreational Trail is located approximately 0.5 mi (0.8 km) north of the proposed interconnection, the presence of the 115-kV transmission line would not significantly affect the recreation experience along this trail.

Table 4.1–12. ROS Impacts Summary for the Western, Central, and Crossover Corridors on the Coronado National Forest

	Western Corridor (30.0 mi on CNF)				Central Corridor (15.1 mi on CNF)*			Crossover Corridor (29.7 mi on CNF) *		
	Compatibility with ROS Class?				Compatibility with ROS Class?			Compatibility with ROS Class?		
Setting Indicator	**Roaded Natural (1.7 mi)**	**Roaded Modified (7.0 mi)**	**Semi-Primitive Motorized (21.3 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (14 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (25.2 mi)**	**Semi-Primitive Non-Motorized (3.3 mi)**
Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remoteness	Yes	No	No	No	Yes	No	No	Yes	No	No
Naturalness	Yes	No	No	Yes	No	No	Yes	No	No	No
Facilities and Site Management	No	No	No	Yes	No	No	Yes	No	No	No
Social Encounters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Visitor Impacts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Visitor Management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Central and Crossover Corridors do not go through the Roaded Modified area.
CNF = Coronado National Forest.
There would be no change to any setting indicators under the No Action Alternative
Although the Proposed Project is not compatible with setting indicators, it would not change ROS settings. See Section 4.1.2.4 for additional information.

4.1.2.6 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no impacts from the proposed project on recreation. Current recreation activities described in Section 3.1.2, Recreation, would continue.

4.2 VISUAL RESOURCES

This section discusses the potential effects on visual resources in the vicinity of the proposed project. The methodology for determining impacts is presented, along with a description of the impacts for each alternative. The terminology and concepts used for the proposed project's potential impacts on National Forest System, Bureau of Land Management (BLM), state, and private land are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS), as described in Section 3.2. The potential impacts for the Coronado National Forest and lands outside of the Coronado National Forest including BLM land are discussed separately, concluding with a summary of visual impacts. Unless otherwise noted, Figure 3.1–1 identifies locations on the Coronado National Forest, and Figure 1.1–4 identifies locations outside the Coronado National Forest.

Methodology

The following project-level SMS steps have been taken for evaluation of visual impacts of the proposed project on the Coronado National Forest. The same steps were taken for evaluation of visual impacts outside of the Coronado National Forest, including Federal lands managed by BLM, except for those items related to scenic classes (for example, in step 2 below), which have not been established for lands outside the National Forest System.

1. Description of the physical changes associated with the proposed project, such as transmission line support structures, access roads, conductor wires, clearing required for the right-of-way (ROW), and substations. This description is supported by photo simulations selected to represent what the alternatives would look like from the most likely viewing areas. For the project on National Forest System land, the most likely viewing areas are Concern Level 1 (primary) and Concern Level 2 (secondary) travelways, and recreational use areas, determined in consultation with USFS. For the project on private and BLM lands, the most likely viewing areas are from residences and major roads (Interstate-19 [I-19]) in nearby towns such as Sahuarita, Green Valley, Amado, and Tubac. The photo simulations portray the range of visual impacts, from wide-open views of the project in the foreground, to partially blocked views of the project, to background views of the project where it is difficult to detect in the landscape. Two maps for each corridor (on and off the Coronado National Forest) depicting the project visibility from travelways and use areas, based on site visits and elevation mapping software, provide a key to understanding the visibility of the project and the location of each photo simulation.

2. Project-level verification of the Scenic Class ratings presented in Figure 3.2–4. Impacts from the proposed project would be most noticeable in locations where the proposed transmission line structures contrast with a landscape in which scenic resources are relatively important (for example, in areas rated as Scenic Class 1 or 2). The Scenic Attractiveness and Concern Level 1 and 2 viewsheds were also verified. The most significant impacts of a proposed project are where the project contrasts with a landscape in an area where scenic resources are relatively important (for example, in Scenic Class 1 or 2 Areas).

3. Evaluation of how the Scenic Integrity would change if the proposed project were implemented, including the potential impacts from proposed access roads and support towers.

4. Discussion of short-term construction impacts, and proposed short-term and long-term visual mitigation measures and the expected effectiveness of these mitigation measures.

This EIS also provides an assessment of impacts to visual resources using the Visual Quality Objectives (VQO) consistent with the *Coronado National Forest Plan*. Appendix I provides that information.

Physical Changes Associated with the Proposed Project

Long-term impacts to visual resources from the proposed project would occur from the introduction of transmission line support structures, access roads, transmission line wires, and clearing required for the ROW. TEP anticipates that a majority of the structures would be self-weathering steel single poles (monopoles), depicted in Figure 1.1–3, with a low reflectance steel material that self-oxidizes, or rusts, to form a reddish-brown protective surface coating, similar in appearance to wood poles of other electrical lines. TEP would use dulled, galvanized steel lattice structures (Figure 1.1–4) in locations where their use would minimize environmental impacts (including visual), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356.

From a visual impact perspective, the primary advantage of monopoles over lattice towers is that monopoles require very little ongoing maintenance following construction, which would allow the obliteration and revegetation of all but a few critical access roads. Another disadvantage of the lattice towers is that self-weathering steel is not an option, as the joints on lattice towers could collect moisture that would interfere with the protective coating that prevents corrosion. Galvanized or painted finishes can be used on lattice towers to darken and reduce shine, but the galvanizing process shortens the life of the finish and painted towers require more access for ongoing maintenance. On the other hand, the primary advantage of lattice towers is that under certain conditions they tend to blend better into the background when viewed from a distance against mountains or vegetation. Also, lattice towers can be spaced farther apart thus requiring fewer towers, although the overall height and breadth of the lattice towers would be greater for increased span lengths.

Because the photo simulations have shown the importance of minimizing access roads to mitigate visual impacts, the advantage of the monopoles in requiring fewer access roads has made them the preferred support structure option of TEP (and USFS on National Forest System land) for the proposed project in terms of minimizing visual impacts. The recommendation from USFS for monopoles on National Forest System lands is given provided that all non-critical access roads (see Section 4.12, Transportation) are obliterated and revegetated following construction. An additional consideration that favors monopoles is that they create less contrast with the natural environment in the foreground when viewed against the sky, such as at road crossings, compared to the very urban, structural look of lattice towers.

The proposed project would utilize conductors (transmission line wires) with a non-specular (not shiny) surface. Non-specular conductors are dipped in an acid bath that takes the shine off the conductors, reducing their visibility. The typical height of the structures would be 140 ft (43 m). The span length between structures would range from 600 to 1,200 ft (183 to 366 m). The support structures would create vertical lines in the landscape, much more pronounced for monopoles than for lattice towers, and the conductors would create horizontal lines that would be visible depending on viewing distance and lighting conditions. Structures located so that viewers would see land or vegetation (such as a mountain) behind the structure rather than sky (that is, skylined) would create less of a visual impact. The text box on the following page describes preparation of the photo simulations to accurately depict the project visibility.

Access roads, which would require a clearing of vegetation and potential reshaping of land contours, would introduce a light-colored linear feature into the landscape. Access roads are most visible during the summer months when monsoon rains turn the landscape green, creating a strong contrast with the light-colored roadways. A number of the photo simulations in this Environmental Impact Statement (EIS) were taken in August, thus depicting a worst-case scenario (most visible) for the access roads.

Preparation of the Photo Simulations

Computer Aided Design (CAD) equipment and Global Positioning Systems (GPS) were used to prepare photo simulations. This allows life-size modeling and ensures a high degree of visual accuracy in the photo simulation. This translates to using real world scale and coordinates (that is, what the viewer would see if they were looking at the view from the location of the camera) to locate facilities, other site data, and the actual camera locations corresponding to three dimensional (3-D) simulation viewpoints. The degree of accuracy of the CAD equipment is absolute; the accuracy for the GPS location data is to within approximately 3.3 ft (1 m).

A CAD site map was imported as a background reference. Microstation CAD drawings of proposed structures and conductors were placed on top of the site map to register and orient the correct locations of photo simulation viewpoints. The 3-D model of the proposed structures and conductors was generated in real world scale. The GPS camera positioning information was then referenced to the 3-D data set.

A 35-mm camera with a 50-mm lens was used consistently throughout the process, with a matching electronic camera lens to allow for viewing of the computer-generated model in the same way that the proposed project would be viewed in the field.

Next, the photographic negative was scanned into the 3-D database and loaded as an environment within which the view of the 3-D model is generated. To generate the correct view relative to the actual photograph, the electronic camera was placed at a location (within the computer) identical to where the photograph was taken. This was supported by the GPS location. Then, the 3-D wire frame model was displayed so that proper alignment, scale, angle, and distance could be verified.

When all lines of the wire frame model exactly matched the photograph, the camera target position was confirmed. To complete this phase, the sun angle was set, materials and textures were applied, and the composite image was rendered through a computer image process known as Ray Tracing. Any additional filters required for appropriate atmospheric conditions, such as blur, focus, and haze were applied at this time.

The photo simulations developed for this project were designed to be viewed 14 in (36 cm) from the viewer's eye. This distance portrays the most realistic life-size image from the location of the simulations viewpoints.

It should be noted that an infinite number of variations related to camera angle, viewer location, distance, and atmospheric conditions exist. The simulations developed for this project incorporated additional mitigating factors such as structure color, structure placements, and use of non-specular (not shiny) conductors. Variations in mitigation measures applied to the simulations, when coupled with camera angle, viewer location, and atmospheric conditions can exponentially increase the variations of even "typical" viewing conditions. The simulations developed for this project captured a variety of viewing conditions under different atmospheric conditions. Dependent on the angle of the sun and viewer, cloud cover, backdropping available, type of facility simulated, and distance from the project, the facility features (such as conductors, cross arms, roads, etc.) may be more or less visible within each simulation (URS 2003b).

4.2.1 Western Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Western Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Western Corridor in some areas, while partially or completely blocking views of the Western Corridor in other areas. Figure 4.2–1 shows the visibility of the Western Corridor on the Coronado National Forest from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Western Corridor; blue for partially-blocked, views of the Western Corridor; and green where the Western Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–1, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Western Corridor would not be visible from an estimated 48 mi (77 km) of Concern Level 1 roads (sections shaded green, including all of I-19). There would be partially-blocked views of the Western Corridor from approximately 5 mi (8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Western Corridor from approximately 9.0 mi (15 km) of Concern Level 1 travelways (shaded in red).

Peña Blanca Lake Recreation Area is Concern Level 1, based on its popularity for recreation. As shown in Figure 4.2–1, the proposed project would not be visible from the lakeshore. Visual Simulation 1 (All Visual Simulations are located at the end of Section 4.2 [URS 2002]) shows that the Western Corridor would be difficult to see from Upper Thumb Picnic Area overlooking Peña Blanca Lake. The view from Upper Thumb Picnic Area represents the worst-case view of the proposed project from Peña Blanca Lake Recreation Area. In this view, the proposed project would be in the middleground to background and would not be skylined.

A typical view from Ruby Road west of the Calabasas Group Area (east of Peña Blanca Lake) is depicted in Visual Simulation 2, in which the proposed project is visible in the foreground, partially shielded by terrain and set against the backdrop of a mountain. The most visible portion of the Western Corridor would be along Ruby Road west of Peña Blanca Lake, especially in an estimated 4-mi (6-km) stretch along Ruby Road, where the project would be highly visible in the immediate foreground. This worst-case visibility from Ruby Road is depicted in Visual Simulation 3. This alignment was developed by TEP in coordination with USFS as a means of protecting the viewshed from Ruby Road looking south towards the Pajarita Wilderness. Although siting the transmission line immediately adjacent to Ruby Road in this segment has a maximum visual impact along Ruby Road, it protects the viewshed to the south for the public (including photographers) and eliminates the need for highly visible access roads in this portion of the project area. Visual Simulation 4 depicts the view of Castle Rock looking southeast from Ruby Road. The Western Corridor is partially visible in the middleground, screened by topography. Both the typical and worst-case scenarios from Ruby Road depicted in these simulations are within Scenic Class 1 Areas, which have high public value as described in Section 3.2.

The other wide-open view of the Western Corridor would be where it crosses Ruby Road, as depicted in Visual Simulation 5. After crossing Ruby Road, the Western Corridor continues north along the west side of the Tumacacori Mountains, extending through the foreground, middleground, and background distance zones to viewers on Ruby Road, as shown in Visual Simulation 6, depicting monopoles with minimum access roads that would be required for this type of structure. For comparison purposes, Visual Simulation 7 shows the same view as in Visual Simulation 6, but with lattice towers and the access roads that would be required for lattice towers.

The remaining views of the Western Corridor from Concern Level 1 roads would be partially obscured views of the project from Ruby Road, and views of the proposed project on National Forest System land in the background distance zone from Arivaca Road. (See the next subsection, Outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, off the National Forest System land). By siting proposed pole locations in areas of lower elevation between ridgetops, the visibility of the Western Corridor from Ruby Road east of Peña Blanca Lake is reduced to several locations with open views of the area. Visual Simulation 8 shows an example of terrain and vegetation shielding looking towards the Calabasas Group Area from Ruby Road (east of Peña Blanca Lake), showing the side profile of a viewer, a proposed structure location, and a hill between the viewer and the structure. Because the Town of Ruby is approximately 3 mi (5 km) west of the Western Corridor, no visual impacts would be expected.

The Concern Level 2 travelways in the proposed project are secondary travelways that intersect either Ruby Road, Arivaca Road, or I-19, and receive a moderate amount of use. As shown in Figure 4.2–1, the Western Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 14 mi [22 km]), would be partially blocked from the segments highlighted in blue (7.5 mi [12 km]), and would not be visible from the segments highlighted in green (39 mi [63 km]). The Western Corridor crosses five Concern Level 2 roads and would dominate views in the foreground at each of these crossings. The Western Corridor would be visible from portions of the road leading to the Pajarita Wilderness, but would be mostly obscured by terrain from the Pajarita Wilderness, and specifically from Sycamore Canyon. The project would be also highly visible from higher elevations on trails leading to Atascosa Lookout and Castle Rock.

The existing Scenic Integrity of the Tumacacori Ecosystem Management Area (EMA) is depicted in Figure 3.2–5. Construction of the proposed project within the Western Corridor would reduce the Scenic Integrity of a 1.0-mi (1.6-km) wide strip of land along the length of the Western Corridor within the Tumacacori EMA, as depicted in Figure 4.2–2. The portion of the Western Corridor west of the Tumacacori Mountains would change from Very High to a combination of Moderate, Low, and Very Low, depending on the amount of access roads selected and the proximity to Concern Level 2 roads where the proposed project would be in the foreground. Where the Western Corridor crosses and remains south of Ruby Road, the Scenic Integrity would change from High to Very Low. The Scenic Integrity of Peña Blanca Lake Recreation Area and Ruby Road to the east would not change, and the Scenic Integrity where the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline and exits the Coronado National Forestwould change from Very High to Moderate. In terms of area, the Scenic Integrity of approximately 13,870 acres (5,613 ha) would be lowered from High or Very High to Moderate or Low, and 4,641 acres (1,878 ha) would be lowered from Very High to Very Low. The existing Scenic Integrity of the Pajarita Wilderness would not change. The reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS Scenery Management System (SMS) does not provide guidance on the significance of visual impacts. Mitigation of long-term visual impacts is ongoing in TEP's project development process. Mitigation includes the precise siting of the ROW at lower elevations between ridgetops, to the extent feasible, to avoid skylining of the structures. The project design process incorporates minimizing the mileage of construction access roads and maintenance roads needed following construction. Existing access roads or trails would be used where feasible, as described in the Section 4.12, Transportation. The type of structure to be used (monopoles or lattice towers) would be selected to minimize overall environmental impacts, including visual, biological, cultural, and other impacts, as determined by an outside party such as USFS in accordance with ACC Decision No. 64356.

These mitigation measures would lessen the overall visual impact of the project, but would not fully eliminate the visual impact. Mitigation measures would be least effective along Ruby Road west of Peña Blanca Lake, where the transmission line would be in the immediate foreground for travelers on Ruby Road. A previous alignment of the Western Corridor originally considered by TEP was to site the ROW an estimated 0.5 mi (0.8 km) south of Ruby Road, between the road and Pajarita Wilderness. For this alignment, the high vantage point of Ruby Road prevented siting the Western Corridor behind terrain features, and the additional impact of access roads in this area added significantly to the visual impacts. Thus, TEP worked in consultation with USFS to realign the Western Corridor immediately adjacent to Ruby Road, in order to minimize impacts to the pristine viewshed south towards the Pajarita Wilderness, and to minimize the need for new access roads to the structures. While the previous alignment would have kept the transmission line out of the immediate foreground of viewers on Ruby Road, the modified alignment along Ruby Road preserves the pristine viewshed of the Pajarita Wilderness (including opportunities for photography), and parallels an existing linear modification to the landscape (Ruby Road).

A short-term visual impact would be generated during construction from dust and equipment. Dust control measures such as watering of access roads would be implemented by TEP to minimize impacts, as discussed in Section 4.8, Air Quality Impacts. Access used for construction that would not be used for ongoing operation and maintenance would be restored to near pre-construction conditions (see Section 4.12, Transportation).

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Western Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Western Corridor (common with the Central and Crossover Corridors), including 1.25 mi (2.01 km) of lands managed by BLM, is characterized by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines (refer to Figure 3.11–1 showing existing utilities). A key factor in evaluating the visual impacts in this area is the visibility of the proposed project from residences and travelways, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the proposed project in some areas, while partially or completely blocking views of the proposed project in other areas. Figure 4.2–3 shows the visibility of the Western and Crossover Corridors along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Western and Crossover Corridors as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Western and Crossover Corridors are not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–3, illustrated by photo simulations from the locations indicated.

As the Western Corridor crosses I-19 and continues southwest, residents, travelers, and recreationalists would have views of the proposed project in the foreground and middleground, with views from many areas in lower terrain obscured by the hills and mine tailings piles in the area. The views of the Western Corridor in Sahuarita, Nogales, and on BLM land, would be in areas already containing development. Visual Simulation 9 shows a foreground view of the proposed project from Mission Road adjacent to BLM land, with TEP's existing and proposed transmission lines. As the Western Corridor separates from the Central Corridor, the Western Corridor (together with the Crossover Corridor) would continue to be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills, but would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Western (and Crossover) Corridor is depicted in Visual Simulation 10, and represents a point of maximum impact in this central portion of the project. Because the characteristic desertscrub vegetation in the project vicinity is low to the ground, this would result in the proposed project being maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows

a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink. Because the Town of Arivaca is approximately 10.5 mi (17 km) west of the Western Corridor, no visual impacts would be expected.

Based on the human alterations to the natural landscape, such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). The Scenic Integrity of this area would not be lowered as result of the proposed project. In the vicinity of the Pima-Santa Cruz County line, the existing Scenic Integrity is High, and would change as a result of the Western Corridor to Moderate to Low, depending on the feasibility of siting the support structures in low terrain.

Mitigation measures and short-term visual impacts would be as described above for the Western Corridor on National Forest System land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.2 Central Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Central Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Central Corridor in some areas, while blocking views of the Central Corridor in other areas. Figure 4.2–5 shows the visibility of the Central Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Central Corridor; blue for partially-blocked, intermittent views of the Central Corridor; and green where the Central Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–5, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Central Corridor would not be visible from approximately 56 mi (90 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in red).

The primary Concern Level 1 travelway from which the Central Corridor on National Forest System land would be visible is Ruby Road where it is crossed by the Central Corridor. The Central Corridor is visible in the foreground as it crosses Ruby Road, within a Scenic Class 1 area. Given that the towers at this location are skylined and in the foreground for viewers on Ruby Road as shown in Visual Simulation 11, monopoles are currently recommended at this location by USFS as they create less of a contrast with the natural environment in this setting. For comparison purposes, Visual Simulation 12 depicts the same location with lattice towers. Because ridges follow both sides of Ruby Road at the crossing point, the transmission line would disappear over the ridges to either side rather than extending into the middleground. Although views of the Central Corridor on the National Forest System land from Arivaca Road would be in the background distance zone, refer to the next subsection, outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, not on National Forest System land. The Central Corridor is not visible from Peña Blanca Lake Recreation Area, Calabasas Group Area, or White Rock Campground, all located along Ruby Road west of the crossing of the Central Corridor.

The Concern Level 2 travelways from which portions of the Central Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–5. The Central Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (9.8 mi [16 km]), and would not be visible from the segments highlighted in green (37 mi [60 km]). A number of Concern Level 2 roads, such as Rock Corral Canyon (Figure 3.7–2), extend into the foothills and provide intermittent open vantage points of the Central Corridor. From more elevated viewpoints, segments of the Central Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Central Corridor in the background as shown in Visual Simulation 13.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Central Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Central Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Central Corridor crosses Concern Level 2 roads in the foreground. Where the Central Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 8,992 acres (3,639 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) would be lowered from High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change. There would be no significant differences in visual impacts between options 1 and 2.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Central Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Central Corridor (common with the Western and Crossover Corridors), including 1.25 mi (2.01 km) of land managed by BLM, is characterized primarily by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines. For discussion and simulation of this common portion of the Central Corridor, refer to Section 4.2.1, Western Corridor.

The Central Corridor parallels I-19 within approximately 1.0 mi (1.6 km) near Amado, Tubac, and Tumacacori, passing adjacent to areas of low intensity residential development, before entering the Coronado National Forest. Figure 4.2–7 shows the visibility of the Central Corridor along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Central Corridor as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Central Corridor is not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–7, illustrated by photo simulations from the locations indicated. The Central Corridor has the longest length outside of the Coronado National Forest, and would be visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19, with some open views from nearby residences in Amado, Tubac, and Tumacacori depending on the terrain setting of each individual house. The Central Corridor would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Central Corridor is depicted in Visual Simulation 14.

Northwest of Tubac, at the Burro Inn (a bed and breakfast establishment), the Central Corridor would be visible in the foreground, partially with a partial backdrop of mountains given the terrain of the area, as shown in Visual Simulation 15. As the Central Corridor passes near Tubac, it would be mostly screened by topography from the Barrio de Tubac subdivision on the east side of I-19, as shown by Visual Simulation 16. The worst-case view of the Central Corridor from residences would occur in Tubac near Piedra Drive. To mitigate the visual impacts to the extent practicable in this location (and for the entire length of the project), TEP considered different pole types and finishes, as shown in Visual Simulation 17. This simulation shows that the lattice towers have an overbearing structural look when viewed against the sky such as would be the case for nearby residents. The monopoles introduce a simpler, narrower change to the landscape in a color similar to wooden utility poles that better blends with the surrounding environment. Thus, the self-weathering steel monopoles in Visual Simulation 17 were selected by TEP to minimize visual impacts for residential locations such as this one in Tubac. Refer to Section 4.4.1.2, Cultural Resources, for potential visual impacts on historic parks in Tumacacori and Tubac.

Because the characteristic desert grassland vegetation in the project vicinity is low to the ground, the proposed project would be maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink.

Given the human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). Upon separating from the Western Corridor, the Scenic Integrity is Moderate, as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. The Scenic Integrity of the vicinity of the Central Corridor off the Coronado National Forest would not change as a result of construction of the Central Corridor.

Mitigation measures and short-term visual impacts would be as described above for the Central Corridor on National Forest System land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.3 Crossover Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Crossover Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Crossover Corridor in some areas, while blocking views of the Crossover Corridor in other areas. Figure 4.2–8 shows the visibility of the Crossover Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Crossover Corridor; blue for partially-blocked, intermittent views of the Crossover Corridor; and green where the Crossover Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–8, as illustrated by the photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby National Forest System lands are Ruby Road, Arivaca Road, and I-19. The Crossover Corridor would not be visible from approximately 75 mi (120 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Crossover Corridor from approximately 40 mi (65 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Crossover Corridor from approximately 7.9 mi (13 km) of Concern Level 1 travelways (shaded in red).

The Concern Level 1 roads from which portions of the Crossover Corridor on the National Forest System land would be visible are Ruby Road, I-19, and Arivaca Road, as shown in Figure 4.2–8 by the road segments highlighted in red. The Crossover Corridor would be visible in two locations from Ruby Road: (1) along the west side of the Tumacacori Mountains where the Crossover Corridor turns east into Peck Canyon, the Crossover Corridor would be visible in the far middleground, set against mountains rather than skylined, with partial shielding provided by the terrain, and (2) the Crossover Corridor would be visible in the foreground as it crosses Ruby Road, the same as depicted in Visual Simulations 11 and 12. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area. From Arivaca Road, views of the Crossover Corridor on National Forest System land would be in the background distance zone (but refer to the next subsection outside of the Coronado National Forest, for the impact of the proposed project as it crosses overhead of Arivaca Road, not on National Forest System land). From I-19, the Crossover Corridor would be just visible from Peck Canyon, in the same view as the Central Corridor shown in Visual Simulation 13, set against the backdrop of the Tumacacori Mountains and foothills. This view of the Crossover Corridor from I-19 is in a Scenic Class 2 area.

The Concern Level 2 travelways from which portions of the Crossover Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–8. The Crossover Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (16 mi [26 km]), and would not be visible from the segments highlighted in green (20 mi [32 km]). A Concern Level 2 road connects Ruby Road to the west end of Peck Canyon, from which the Crossover Corridor would be in the foreground. A number of Concern Level 2 roads also extend into the foothills from I-19 and provide intermittent open vantage points of the Crossover Corridor. From more elevated viewpoints, segments of the Crossover Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Crossover Corridor in the background as shown in Visual Simulation 13. Within Peck Canyon, there are recreational trails as described in Section 3.1.2, Recreation, from which the Crossover Corridor would be in the foreground, though none of these have been identified as Concern Level 2 travelways.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Crossover Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Crossover Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from the existing Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Crossover Corridor crosses Concern Level 2 roads and would thus be in the foreground. Where the Crossover Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 18,060 acres (7,307 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) acres would be lowered from Very High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change. There would be no significant differences in visual impacts between options 1 and 2.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Crossover Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of National Forest System land is identical to the Western Corridor, and thus the impacts would be identical to the Western Corridor in this overlapping segment, as described in Section 4.2.1. Mitigation measures and short-term visual impacts would also be as described above for the Western Corridor on National Forest System land.

4.2.4 115-kV Interconnection of the Gateway and Valencia Substations

The maximum height of the structures for the 115-kV line would be approximately 55 to 65 feet (1.7 km to 2 km) with a minimum ground clearance for conductors of 32 to 37 feet (0.98 and 1.1 km).

There are no predicted high visual impacts resulting from the proposed interconnection. Visual impacts would be reduced in areas where the interconnection would be built adjacent to existing transmission or distribution lines and other linear facilities such as roads. The application of mitigation measures, in combination with the strategic siting of the interconnection, would result in less impact than would otherwise occur. Potential visual impacts for the proposed route are described in the following sections.

Visual Impacts to Scenic Quality and Mitigation Measures

The elements of scenic quality include the character and diversity of landform, vegetation, water, color, and cultural or man-made features. These features become the basis for separating the study area into units, which identify the relative scenic value of a landscape. Impacts to scenic quality indicate the change in the landscape with the introduction of the proposed project.

Impacts to scenic quality indicate change in the value of the landscape, regardless of how it is viewed. Impacts to scenic quality in the project area are anticipated to be low where the transmission line route is located along existing industrial and commercial areas (approximately 1.8 miles [2.9 km]). To minimize vegetation removal, construction methods would include using a crane to set the poles from the existing access road. Such mitigation would be effective in reducing visual impacts. In addition, the interconnection would be double-circuited with an existing 115-kV transmission line for the last 0.4 mile (0.6 km) and would parallel numerous distribution lines.

Visual Impacts to Sensitive Viewers and Mitigation Measures

Sensitive viewers were identified through field reconnaissance, previous studies, and aerial photograph interpretation. Sensitive viewers were assigned a visual sensitivity level of high or moderate. The sensitivity of a viewpoint reflects the degree of viewer concern. Sensitivity is measured by evaluating the type of viewpoint in the landscape, volume of use, viewing duration, public and agency management concerns, and influence of adjacent land use. High levels of visual sensitivity were assigned to residences. Moderate levels of sensitivity were assigned to SR 189, I-19, and the Sgt. Manuel H. Tapia Recreational Trail.

Residences - Low visual impacts would occur from a majority of the residences inventoried within the project area. Residences north of the proposed interconnection would be screened from the view of the proposed route by changes in terrain and existing industrial structures resulting in low impacts. Residential areas located where the line runs north-south between I-19 and the Valencia Substation would also have low impacts as a result of changes in terrain and underbuilding of the existing 115-kV transmission line.

Travel Routes - Visual impacts to travelers along SR 189 and I-19 are anticipated to be low because of short viewing duration, screening from variations in topography, and existing distribution lines currently crossing these roads.

Recreational Areas - Impacts to Sgt. Manuel H. Tapia Recreational Trail are expected to be low. Much of the proposed route is not visible from the recreational area because of variations in topography and its distance from the proposed project (about 0.75 mile [1.3 km]). However, in areas where it would be visible, the proposed interconnection would be backdropped by the existing terrain. In addition, the visible areas of the proposed interconnection would follow existing distribution lines. Proposed mitigation methods such as use of non-specular conductors and dulled finish structures would lessen the impact of the proposed transmission line.

Construction of the proposed 115-kV transmission line interconnection would have a minimal effect on visual resources. The existing linear features (i.e., roads and existing distribution and transmission lines) in the area in combination with the industrial nature of the area would minimize any impact the project would have on the landscape. In addition, the proposed mitigation would decrease impacts to visual resources in the area.

4.2.5 Summary of Visual Impacts

Coronado National Forest. The areas of land that would have reduced Scenic Integrity as a result of construction and operation of the proposed project for each action alternative are as shown in Table 4.2–1. As stated previously, the reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS SMS does not provide guidance on the significance of visual impacts. From approximately 9.0 mi (14 km) of Concern Level 1 travelways (out of a total of 62 mi [99 km]) on and nearby the Tumacacori EMA, the Western Corridor would be in wide-open view on National Forest System lands. From approximately 3.0 mi (4.8 km) of Concern Level 1 travelways on and nearby the Tumacacori EMA, the Central and Crossover Corridors would each be in wide-open view on National Forest System lands.

Table 4.2–1. Summary of Reduced Scenic Integrity on the Coronado National Forest

Western Corridor		Central Corridor		Crossover Corridor	
Change	**Acres**	**Change**	**Acres**	**Change**	**Acres**
From Very High or High to Moderate or Low	13,870	From Very High to Moderate or Low	8,992	From Very High to Moderate or Low	18,060
From High to Very Low	4,641	From High to Very Low	676	From High to Very Low	676
Total Reduced Scenic Integrity:	18,511	Total Reduced Scenic Integrity:	9,668	Total Reduced Scenic Integrity:	18,736

The Central Corridor would minimize the total mileage on National Forest System land resulting in reduced Scenic Integrity of an estimated 9,668 acres (3,912 ha) on National Forest System land. The Western and Crossover Corridors would have higher total mileage on National Forest System lands than the Central Corridor, and the Western and Crossover Corridors would result in an estimated 18,511 to 18,736 acres (7,491 to 7,582 ha) of reduced Scenic Integrity on National Forest System lands. Accordingly, the Western and Crossover Corridors would have greater overall visual impact on the Coronado National Forest than the Central Corridor (USFS 2002c).

Outside of the Coronado National Forest. The proposed project outside of the Coronado National Forest would cross an estimated 36 mi (51 km) of land for the Western and Crossover Corridors, and an estimated 42 mi (68 km) of land for the Central Corridor. With the exception of a reduction in Scenic Integrity associated with the Western and Crossover Corridors near the Pima and Santa Cruz County line, the existing Moderate to Low Scenic Integrity would not be reduced for the area crossed by each corridor outside of the Coronado National Forest, including the BLM land. The Central Corridor has the longest length outside of the Coronado National Forest, and would be intermittently visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

4.2.6 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. The existing landscape and Scenic Integrity, as described in Section 3.2, Visual Resources, would be expected to continue, subject to visual impacts from potential development in the project area (see Chapter 5, Cumulative Impacts). No amendment to the Forest Plan for the Coronado National Forest would be adopted. Existing management direction and land and resource allocations in the Forest Plan would remain unchanged.

4.3 BIOLOGICAL RESOURCES

This section discusses the potential effects on biological resources of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project within each alternative corridor. The methodology for determining impacts is presented, followed by a description of the impacts from each alternative.

Methodology

The biological resource impact analysis consists of an evaluation of the effects generated by the construction and operation of the proposed action, for all land jurisdictions on specific biological resources (for example, vegetation communities). Additional analysis of the National Forest System lands and Bureau of Land Management (BLM) land has been included to assist those agencies in evaluating impacts to unique or specific resources under their administration. This additional analysis is not appropriate for resources outside of their jurisdiction because their authority only covers land under their administration. Impacts to biological resources are described relative to the affected environment in Section 3.3. As discussed in that section, no meaningful differences in existing biological resources have been identified between Options 1 and 2 for the Central or Crossover Corridors, except for higher habitat disturbance and fragmentation for Option 2. Impacts described in this section would be qualitatively the same for these two sub-routes, but slightly lower in magnitude for Option 2.

To determine if an action may cause a significant impact, both the context of the proposed action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, presence of special-status species) and the degree to which the proposed action may adversely affect such unique resources. Impacts would be significant if the proposed action or alternatives change the biological resources in the long term.

4.3.1 Biodiversity

Biodiversity in the area results from the convergence of climatic zones, topographic relief (range of elevations), variable geology, and precipitation patterns (Wildlands Project 2000). The proposed project would not alter these factors on a scale that would cause a regional decline in biodiversity. Potential impacts to species listed by the U.S. Fish and Wildlife Service (USFWS), USFS, BLM, Arizona Department of Agriculture (ADA), or the Arizona Game and Fish Department (AGFD) are provided in the remainder of Section 4.3.

4.3.1.1 *Western, Central, and Crossover Corridors*

Impacts to biodiversity for the three proposed corridors would be similar. Individual plant and animal species whose occurrences are considered rare in the proposed corridors may be directly or indirectly impacted through the construction, maintenance, and/or operation of the proposed powerline. No decline in the biodiversity of the region is anticipated as a result of building the transmission lines in any of the three proposed corridors.

4.3.1.2 *No Action Alternative*

No impacts to biodiversity would result under this alternative. Existing biodiversity would continue as described in Section 3.3.1.

4.3.2 Vegetation and Wildlife

Impacts to vegetation would be similar under all action alternatives. Potential impacts to vegetation and wildlife, as a result of the construction of the transmission line include loss or disturbance to existing native plant communities and potential adverse effects to wildlife including some mortality of individual wildlife, interference with breeding, loss of habitat, and loss of forage plants. Impacts would result from construction of temporary access roads and lay down yards, construction of poles and permanent access roads, clearing of vegetation, and line maintenance. No changes in wildlife distribution are expected to occur on a regional scale as a result of the proposed project although small animal species (e.g., small mammals, reptiles, amphibians) may be excluded from areas that are cleared for support structures or access roads as a result of loss of habitat. Because the ROW would not be fenced or otherwise separated from surrounding lands, no changes in live-stock distribution would be expected as a result of the project. Mortality of wildlife from collision with vehicles is possible, although the number of collisions would be minimal due to limited access to new roads. Impacts to vegetation were calculated based on preliminary siting of access roads that are approximately 12 ft (3.7 m) wide and a 100 ft (30 m) radius around each pole location (see Section 4.12, Transportation, for discussion on revegetation with native species). Short-term disturbances of previously undisturbed biological habitats from the construction of the transmission line and substations could cause long-term reductions in the biological productivity of an area. These long-term effects tend to be more pronounced in arid areas such as the proposed project area where biological communities recover very slowly from disturbances. Refer to Figure 3.3–1 for a map of the vegetation types in the following sections.

Potential direct effects to wildlife as a result of blasting may include: increased noise and visual disturbances, loss of foraging, cover, and nesting habitats, mortality due to collisions with construction equipment accessing the blasting sites, and mortality due to blasting. These impacts are unlikely to lead to a downward population trend or loss of population viability for any wildlife or migratory bird populations occurring in the project area. No blasting would occur during peak breeding times for migratory birds (April through August) to minimize the impacts to migratory birds.

Habitat Fragmentation. There would be an increase in habitat fragmentation in the immediate vicinity of any of the action alternatives This increase would be the least for the Central Corridor since it follows an existing utility corridor to a greater extent than the other alternatives do and, thus, would require the least clearing of vegetation.

The increase in habitat fragmentation would be mitigated in all proposed corridors by road closures and subsequent habitat restoration following construction (see Section 2.1). On the Coronado National Forest official road densities would not increase (see Section 4.12 for discussion of road closures and changes in road densities), so there would be no *net* increase in habitat fragmentation in the Coronado National Forest under any of the alternatives. However, if roads that have been officially closed continue to be used (e.g., by off-road vehicles or hikers), then the proposed project could result in a net increase in habitat fragmentation.

Construction of the transmission line through areas of Madrean Evergreen Woodland would have the greatest potential to increase habitat fragmentation as it would create a linear opening that would separate two parts of a forest. Most vegetation in the region is, however, low-growing (e.g., desertscrub, semidesert grassland). In such habitats, vegetation would normally be pruned to ground level during construction, keeping the roots intact to maximize restoration potential in areas not needed for ongoing maintenance access (see Section 2.2.4). Once operational, low-growing vegetation would remain intact under the transmission lines, reducing habitat fragmentation. Tall vegetation, however, would occasionally need to be trimmed to maintain a safe distance between the tops of trees and the conductors so as to not interfere with safe operation of the transmission line (see Section 4.10.1). However, because

of the arid nature of the region, vegetation grows slowly so that its removal after construction would be minor and only be needed at infrequent intervals.

Fragmentation of riparian habitat could occur where the proposed transmission line crosses it. However, the amount of such habitat that would be disturbed is minimal, and the habitat tends to be narrow so that it could often be spanned. Thus, impacts to it would be minimal.

This shift in habitat fragmentation is not likely to result in the decrease of biodiversity on a regional scale. However, local disturbances may alter use of the area by wildlife. These disturbances are not likely to cause a decline in populations or a loss of viability of any Special Status species (see Section 4.3.3).

4.3.2.1 *Western Corridor*

Potential impacts to vegetation in the Western Corridor are summarized in Table 4.3–1.

Table 4.3–1. Estimated Area of Vegetation Communities Potentially Disturbed in the Western Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	165	102	8	55
Madrean Evergreen Woodland	95	95	0	0
Sonoran Riparian Deciduous Forest	0.14	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.3	0.3	NA	NA
Total	**382**	**198**	**8**	**177**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Impacts to USFS Classified Riparian only apply to riparian vegetation on lands administered by USFS because this classification system is unique to that agency. Impacts to USFS Classified Riparian areas are based on those identified in the Roads Analysis for the proposed project (URS 2003a). Under this alternative, an estimated 0.3 acres (0.12 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on National Forest System lands.

Wildlife. Impacts to wildlife as a result of construction would include mortality of smaller species such as rodents, reptiles, and amphibians. Additional impacts to wildlife include the loss of food, cover, and breeding sites. The construction of new access roads would also increase public access into new areas that may result in disturbances to wildlife and their habitat by human use. Construction of the line in the Western Corridor would be unlikely to impede the movements of animals because it would not present a major barrier. However, construction of access roads, pole sites, and lay down areas would alter microclimatic conditions. These impacts are unlikely to substantially reduce wildlife populations in the region because of the relatively small areas impacted. Additional impacts would include the potential for mortality of birds and bats resulting from collisions with the lines. Impacts to migratory birds and raptors are discussed further in Section 4.3.4.

4.3.2.2 *Central Corridor*

Potential impacts to vegetation in the Central Corridor are summarized in Table 4.3–2.

Table 4.3–2. Estimated Area of Vegetation Communities Potentially Disturbed in the Central Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	109	67	8	34
Madrean Evergreen Woodland	38	38	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.1	0.1	NA	NA
Total	**269**	**105**	**8**	**156**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Under this alternative, an estimated 0.1 acres (0.04 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on National Forest System lands.

Wildlife. Impacts to wildlife would generally be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

4.3.2.3 *Crossover Corridor*

Potential impacts to vegetation in the Crossover Corridor are summarized in Table 4.3–3.

USFS Classified Riparian. Under this alternative, an estimated 0.05 acres (0.02 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on USFS system lands.

Wildlife. Impacts to wildlife would be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

Table 4.3–3. Estimated Area of Vegetation Communities Potentially Disturbed in the Crossover Corridor

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	97	66	8	23
Madrean Evergreen Woodland	72	72	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	0.05	0.05	NA	NA
Total	**291**	**138**	**8**	**145**

[a] Source: Roads Analysis (URS 2003a).

4.3.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Construction of the proposed 115-kV transmission line interconnection would require some clearing of mesquite scrub in the semidesert grassland. This clearing is expected to be minimal in areas where the new transmission line follows an existing line or in areas that have been converted to urban uses. The greatest impacts on vegetation along the proposed route would be in relatively undisturbed areas of semidesert grassland on the south side of Mariposa Canyon and between the canyon and the west end of the new substation site.

Impacts to vegetation are not expected to be significant because of the limited amount of disturbance needed to construct a transmission line and because of the extensive distribution of semidesert grassland in southern Arizona. Potential impacts to vegetation on the south side of Mariposa Canyon would be mitigated through the use of a crane to construct the line from an existing access road.

Wildlife. Construction of the proposed transmission line interconnection could have direct impacts on reptiles and small rodents. These impacts are expected to be minimal because of the limited area that would be affected. Larger and more mobile mammals and birds could avoid the construction area and would not be subject to direct impacts. Potential indirect impacts to wildlife include disturbances related to construction activities, including clearing, heavy equipment use, noise, and dust emissions. These impacts are expected to be temporary and minimal.

4.3.2.5 *No Action Alternative*

There would be no impact to vegetation and wildlife associated with the No Action Alternative. Existing conditions would continue as described in Section 3.3.2. No amendments to the Forest Plan for the Coronado National Forest would be adopted. Existing management direction and land and resource allocations in the Forest Plan would remain unchanged.

4.3.3 Special Status Species

Harris Environmental Group prepared the Final Biological Assessment for each of the proposed corridors and the 115-kV interconnection in accordance with the USFWS Section 7 Handbook (USFWS 1988). The complete text of the Final Biological Assessments is provided in Appendices D (Western Corridor), E (Central Corridor), F (Crossover Corridor), and K (115-kV interconnection). All of the action alternatives would have the potential to impact species listed under the *Endangered Species Act* (ESA), as

amended. Therefore, the U.S. Department of Energy (DOE) has initiated consultation with USFWS under Section 7(a)(2) of the ESA. The formal consultation process between DOE, USFS, BLM, and USFWS began when DOE requested it and sent its biological assessment of the alternatives to the USFWS (see letters in Appendix A). During formal consultation USFWS: (1) reviews all relevant information provided by DOE, USFS, and BLM; (2) evaluates the current status of the listed species and critical habitat; (3) evaluates the effects of the action and cumulative effects on the listed species or critical habitat; and (4) formulates a Biological Opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Upon completion of the review and evaluation, USFWS presents its Biological Opinion and discusses its findings with DOE, USFS, BLM, and TEP. USFWS also identifies the availability of any reasonable and prudent alternatives, including mitigation, that DOE, USFS, BLM, and TEP can implement to avoid "take" (harm or harassment of a threatened or endangered species) as defined in the ESA.

In response to DOE's request for formal consultation on the Western Corridor (DOE's identified preferred alternative in the draft EIS), the USFWS provided a Biological Opinion on that alternative on April 26, 2004 (see Appendix D). On September 21, 2004, DOE initiated consultation with USFWS to prepare a Biological Opinion for the Central Corridor (see Appendix A). If a BA is needed for the Crossover Corridors, it would be obtained through consultation with the USFWS prior to construction.

The main impact on special status species would result from the destruction or alteration of a species' habitat and the increase in human activity. Additionally, the increased potential for wildfires as a result of sparks from vehicles is a potential impact common to all of the action alternatives (HEG 2004a, 2004b, 2004c, 2004d). Wildfires that start as a result of the proposed project have the potential to impact one or more special status species, including threatened and endangered species. Additionally, ground disturbances could facilitate the establishment of nonnative species, such as Lehman's lovegrass, which could alter the natural fire regime. Wildfires could also remove ground cover that is important in dissipating rainfall energy and reducing erosion (HEG 2004a, 2004b, 2004c, 2004d). Increased erosion as a result of wildfires could harm all of the fish and frog species listed in Table 4.3–4.

For threatened and endangered species, three types of effects determinations were made:

1. *No effect* determinations were not quantified. No effect means that there are no effects of the project, positive or negative, on a species.

2. *May affect/not likely to adversely affect* determinations mean that all impacts are beneficial, insignificant, or discountable. Such determinations require concurrence from the USFWS. These determinations were not quantified because "based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur" (USFWS 1998).

3. *May affect/likely to adversely affect* determinations were evaluated according to the primary action causing the indirect adverse effect (for example, erosion from roads increasing sediment load into watersheds). While this may not realistically reflect the magnitude of effect to individual species, the consistency of evaluation across the three corridors allows for comparisons between them. This determination means that there is at least one adverse effect of the proposed action and requires formal consultation with the USFWS.

Table 4.3–4 summarizes the determination of effects for all species considered in the Biological Assessments for all of the corridors. These determinations were made based on contact with the USFWS, USFS, BLM, and AGFD regarding all species potentially affected by the project. Determinations were made after reviewing the current status of each species, the environmental baseline of each alternative, and the effects of the proposed actions (including the cumulative effects) (HEG 2004a, 2004b, 2004c). Species for which it was determined that the project "may affect" are discussed below in Sections 4.3.3.1 to 4.3.3.3. Detailed discussions are included in the Biological Assessments (see Appendices D, E, F, and K) appended to this EIS.

With the exception of Sonora chub and the Mexican Spotted Owl (see Section 3.3), no impacts to critical habitat, either proposed or currently designated at the time this EIS is published, would occur under any of the alternatives. All three alternative corridors cross the recently-designated critical habitat for the Mexican Spotted Owl (see Figures 3.3-2, 3.3-3, and 3.3-4).

Harris Environmental Group (HEG 2004a, 2004b, 2004c) evaluated potential impacts to USFS sensitive species to determine if there is: (1) a downward trend in population numbers, or (2) a downward trend in habitat capability that would reduce a species' existing distribution. With the exception of supine bean, the potential impacts under the Western, Central, and Crossover Corridor Alternatives would not result in a downward trend in population numbers or a downward trend in habitat capability. This determination was made by reviewing each species' population, distribution, and habitat requirements and the proposed impacts. Generally, no downward population or habitat trends are expected for one or more of the following reasons:

- Other viable populations are present outside of the corridors but within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, or within other mountains in southern Arizona;
- Only a small percentage of the total population would potentially be impacted;
- Minimal suitable habitat is present in the corridor;
- Only a small percentage of foraging habitats would potentially be impacted;
- Some of the plant species are adapted to disturbed habitat; or
- The only known populations are outside of the corridors.

Because of the recent decline in monitored populations of supine bean and drought conditions in 2002, additional surveys would need to be conducted prior to construction in potential supine bean habitat (HEG 2004a, 2004b, 2004c, and 2004d). If populations are found in the vicinity of construction, consultation with USFS biologists would be initiated to minimize impacts. Once surveys and additional consultation are completed, impacts are likely to be limited to individual plants and not whole populations. Therefore, impacts are not likely to result in a trend toward Federal listing or loss of population viability.

Table 4.3–4. Effects Determination of Threatened and Endangered Species Potentially Occurring in Pima and Santa Cruz Counties, Arizona

Species	Western Corridor	Central Corridor	Crossover Corridor
Plants			
Canelo Hills Ladies' Tresses	No Effect	No Effect	No Effect
Huachuca Water Umbel	No Effect	No Effect	No Effect
Kearney's Blue Star	No Effect	No Effect	No Effect
Nichol's Turk's Head Cactus	No Effect	No Effect	No Effect
Pima Pineapple Cactus	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mammals			
Jaguar	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Jaguarundi	No Effect	No Effect	No Effect
Lesser Long-nosed Bat	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Gray Wolf	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Sonoran Pronghorn	No Effect	No Effect	No Effect
Ocelot	No Effect	No Effect	No Effect
Birds			
Bald Eagle	No Effect	No Effect	No Effect
Brown Pelican	No Effect	No Effect	No Effect
Cactus Ferruginous Pygmy-owl	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Spotted Owl	**May affect, *not* likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Masked Bobwhite	No Effect	No Effect	No Effect
Mountain Plover	No Effect	No Effect	No Effect
Northern Aplomado Falcon	No Effect	No Effect	No Effect
Southwestern Willow Flycatcher	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Amphibians			
Chiricahua Leopard Frog	**May affect, likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Sonoran Tiger Salamander	No Effect	No Effect	No Effect
Fish			
Desert Pupfish	No Effect	No Effect	No Effect
Gila Top Minnow	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Loach Minnow	No Effect	No Effect	No Effect
Sonora Chub	**May affect, likely to adversely affect; may affect, not likely to adversely modify critical habitat**	No Effect	No Effect
Spikedace	No Effect	No Effect	No Effect
Gila Chub	No Effect	No Effect	No Effect

Source: HEG 2004a, b, and c.

Table 4.3–5 summarizes the potential impacts to USFS sensitive species under each alternative.

Wildlife surveys were conducted in the proposed corridors only for the special status species as part of the preparation of the Biological Assessments in support of the proposed project.

Table 4.3–5. Impacts to Forest Service Sensitive Species

Common Name	Present in Corridor	Effects Determination By Corridor
Plants		
Alamos Deer Vetch	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arid Throne Fleabane	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arizona Giant Sedge	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Bartram's Stonecrop	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.
Beardless Chinch Weed	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Broad-leaf ground cherry	Central, Crossover	Central & Crossover - No effects are anticipated.
Catalina Beardtongue	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.
Chiltepin	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Chihuahuan Sedge	All	Central & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Western - No effects are anticipated.
Chiricahua Mountain Brookweed	All	All - No effects are anticipated.
Foetid Passionflower	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Gentry Indigo Bush	All	Central & Crossover - Minimal or no effects are anticipated. Western – May impact individuals but not likely to result in trend toward listing or loss of population viability.
Large-Flowered Blue Star	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Lumholtz Nightshade	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Mock-Pennyroyal	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Nodding Blue-eyed Grass	All	All - No effect is anticipated.
Pima Indian Mallow	Central, Crossover	Central - No effects are anticipated. Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Beehive Cactus	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Star Leaf	All	Western & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central - No effects are anticipated.
Santa Cruz Striped Agave	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*)

Common Name	Present in Corridor	Effects Determination By Corridor
Seeman Groundsel	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effects are anticipated.
Sonoran Noseburn	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Superb Beardtongue	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Supine Bean	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability. Given recent population declines, additional surveys may be warranted upon selection of a preferred alternative. USFS would be consulted prior to impacting any known populations.
Sweet Acacia	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Three-nerved scurf-pea	Crossover	Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber Hoary Pea	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber's Morning-glory	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Virlet Paspalum	All	All - No effects are anticipated.
Weeping Muhly	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wiggins Milkweed Vine	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wooly Fleabane	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effects are anticipated.
Mammals		
Cave Myotis	All	All - Forage habitat may be disturbed but not likely to result in trend toward listing or loss of population viability.
Southern Pocket Gopher	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Birds		
American Peregrine Falcon	All	All - Not likely to impact nesting sites and not likely to result in trend toward listing or loss of population viability.
Five-Stripped Sparrow	All	All - No effects are anticipated.
Northern Gray Hawk	All	All – May impact individuals but not likely to result in a trend towards Federal listing.
Western Yellow-billed Cuckoo	All	All - May impact individuals but not likely to result in a trend towards Federal listing.
Reptiles/Amphibians		
Giant Spotted Whiptail	All	All - No effects are anticipated.
Lowland Leopard Frog	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Mexican Garter Snake	All	All - May impact individuals if riparian areas are impacted. Not likely to result in a trend towards Federal listing.
Western Barking Frog	All	All - No effects are anticipated.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*)

Common Name	Present in Corridor	Effects Determination By Corridor
Invertebrates		
Arizona Metalmark	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.

Source: HEG 2004a, b, and c.

Arizona Department of Agriculture Species. On private lands, such as those within the proposed project area landowners are not required to salvage species on the ADA List of Protected Native Plants (State of Arizona 1997). Under state law, landowners have the right to destroy or remove plants growing on their land including all cacti, yucca, and other succulent species. Because the proposed project is a Federal action, the ADA would be notified if plants within the ROW would be removed and later transplanted or permanently destroyed. An ADA Notice of Intent (NOI) to clear land is required 20 to 60 days prior to the destruction of any plants. Further study would be performed as needed upon precise siting of the ROW.

4.3.3.1 *Western Corridor*

ESA Listed Species

Impact to 10 of the 27 species listed by USFWS would occur under this alternative and are detailed in the Biological Assessment (Appendix D). A summary of impacts to these species are discussed below.

Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*) -Endangered. Construction of the Western Corridor may affect, and is likely to adversely affect cactus ferruginous pygmy-owls (HEG 2004a). Although no cactus ferruginous pygmy-owls are known to occur in surveyed areas in the Western Corridor, habitat for this species is present (see section 3.3.3.1). A preliminary assessment of construction-related impacts indicates the following cactus ferruginous pygmy-owl habitat types would be altered: 34 acres (9 ha) of Sonoran Desertscrub, 46 acres (18 ha) of Desert Riparian Scrub, and 0.14 acres (0.06 ha) of Deciduous Riparian. According to the Harris Environmental Group (HEG 2004a), "short term noise disturbance and human activity associated with construction may temporarily discourage cactus ferruginous pygmy-owl use of habitat within and immediately adjacent to the proposed right-of-way." Further impacts include modification of habitat due to clearing vegetation and building project structures and an increase in human activities as a result of new access. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, cactus ferruginous pygmy-owls (HEG 2004a).

To minimize potential adverse impacts to cactus ferruginous pygmy-owls, construction activities during the breeding season would only occur following additional surveys, and the Conservation Measures outlined in Section 1.4 of the Biological Assessment (HEG 2004a) would be used. If these measures were employed, impacts to cactus ferruginous pygmy-owls would not be expected to rise to the level of take.

According to Harris Environmental Group (HEG 2004a), "No take of CFPO [cactus ferruginous pygmy-owl] is anticipated for the following reasons: (1) construction activities during breeding season would only occur following protocol surveys; (2) the Conservation Measures outlined in Section 1.4 (of the Biological Assessment) will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future."

Chiricahua Leopard Frog (*Rana chiricahuensis*) -Threatened. Construction of the Western Corridor may affect, and is likely to adversely affect Chiricahua leopard frogs (HEG 2004a). No direct impacts to Chiricahua leopard frog habitat (i.e., stock tanks or other aquatic habitats) would occur under this

alternative because no construction activities would occur in these habitats. Individuals could be present, however, on land some distance away from these areas, and construction traffic could result in fatalities from vehicle collisions. Indirect impacts could occur from removal of vegetation due to construction that could increase surface runoff and sediment into Chiricahua leopard frog habitat. Additional impacts may include the spread of the chytrid fungus, known to cause mortality in frogs, into areas that are not currently accessible by vehicle. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, Chiricahua leopard frogs (HEG 2004a).

To minimize potential adverse impacts to Chiricahua leopard frogs: (1) no construction activities would occur within occupied streams, stock tanks, or other Chiricahua leopard frog habitat; (2) BMPs would be implemented to minimize erosion; and (3) equipment cleaning stations would be established at appropriate sites to prevent the spread of disease. If these measures were employed, impacts to Chiricahua leopard frogs would not be expected to rise to the level of take.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect Gila topminnows (HEG 2004a). No direct effects to Gila topminnows are anticipated because no construction would occur within occupied habitat. The closest populations are about 12 mi (19 km) east of any of the corridors (see section 3.3.3.1). Some indirect effects to topminnow habitat are possible due to erosion that could result from project construction. Increased surface runoff and sediment transport into Gila topminnow habitat in the Santa Cruz River watershed could occur. Any such effects would be relatively small due to the distance of the proposed project from occupied habitat; BMPs to minimize sediment transport would also be used (HEG 2004a). Due to the real but limited potential for impacts to Gila topminnow, construction of the Western Corridor may affect, but is not likely to adversely affect, this species (HEG 2004a). Any such effects would not be expected to rise to the level of take.

Jaguar (*Panthera onca*)- Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect jaguars (HEG 2004a). Impacts to jaguars may result from noise disturbance associated with construction activities, especially during early morning or late evening hours. However, these impacts would be widely distributed because of the linear nature of the project. Additional impacts would result from habitat modification and fragmentation, and subsequently impacts to prey species, due to the construction of roads and poles. The primary prey of jaguars include deer, which have relatively large home ranges. The proposed project would be unlikely to result in a decline in the regional deer population. In the event that remote monitoring of the Arizona-Mexico border to be undertaken by the Jaguar Conservation Team documents a female jaguar or cubs within the Tumacacori EMA, consultation with USFWS would be reinitiated (HEG 2004a).

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*) -Endangered. Construction of the Western Corridor may affect and is likely to adversely affect lesser long-nosed bats (HEG 2004a). According to the Biological Assessment (HEG 2004a), "indirect effects to lesser long-nosed bats may result from disturbance (removal) of agaves and saguaro cacti during construction of temporary access roads or the installation of poles." Agaves and saguaro are distributed in patches, and the loss of significant numbers of either species may alter foraging patterns or roost selection, or reduce individual survivorship. These impacts, however, would be widely distributed and relatively minor because of the linear nature of the project. Furthermore, forage plants would be transplanted, thereby further lessening impacts, although there could be some impacts from transplantation failure. Any resulting project impacts to lesser long-nosed bats would not be expected to rise to the level of take.

Mexican Gray Wolf (*Canis lupus baileyi*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect lesser Mexican gray wolves (HEG 2004a). The proposed action would not affect individual Mexican gray wolves because the species is not present in the project area,

and there are no plans by USFWS to re-introduce it to the region. A small amount of potential wolf habitat would be permanently affected, however, by project construction. In the event any Mexican gray wolves moved into or through the project area, they could be impacted by project effects on their prey or by project operations such as patrols by helicopter (HEG 2004a). Any such effects should be small because the project is unlikely to reduce prey on a regional basis, and operational disturbances would be infrequent. Nevertheless, because there could be future impacts due to the project, construction of the Western Corridor may affect, but is not likely to adversely affect, Mexican gray wolves.

Mexican Spotted Owl (*Strix occidentalis lucida*) -Threatened. Construction of the Western Corridor may affect, but is not likely to adversely affect Mexican spotted owls (HEG 2004a). Direct effects on Mexican spotted owls could result from disturbance by construction activities that could discourage nesting in suitable habitat. The greatest likelihood of noise disturbance would be from use of helicopters during construction of the transmission lines (HEG 2004a). To minimize potential for disturbance from construction, no construction would occur within 1 mi (1.6 km) of the two Protected Activity Centers identified south of Ruby Road (see section 3.3.3.1) during the breeding season of March 1 to August 31 (HEG 2004a). In addition, construction during non-breeding season would be short term. Surveys would be performed in advance of construction in Sycamore Canyon where Mexican spotted owls have been reported but where there are no Protected Activity Centers. Should the species be present, USFWS would be consulted for further guidance.

All of the corridor alternatives would cross the recently designated critical habitat for the Mexican spotted owl. Figures 3.3-2, 3.3-3 and 3.3-4 shows the corridors in relation to the critical habitat designation. A short section of access road [0.07 mi (0.113 km)] would be constructed within one of the Protected Activity Centers. Associated impacts should be minor because the only deciduous vegetation present is not of sufficient size to function as structural Mexican spotted owl habitat, and no trees greater than 9 inches (23 cm) in diameter at breast height would be removed (HEG 2004a).

Therefore, the construction-related activities outlined above may affect non-breeding Mexican spotted owls, but would not be likely to adversely affect the species, because construction would occur during a non-critical life stage, would be short term, and should not affect structural habitat function.

Pima Pineapple Cactus (*Coryphantha scheeri* var.*robustispina*)-Endangered. Construction of the Western Corridor may affect, and is likely to adversely affect, Pima pineapple cacti through hindering seedling establishment (HEG 2004a). Although no individual Pima pineapple cacti would be directly impacted because the locations of poles and access roads would be modified to avoid sensitive areas (HEG 2004a), indirect impacts could occur. These would include new access roads to Pima pineapple cacti populations, thereby exposing these populations to illegal collection. Any adverse effects to this species would be mitigated by purchase of mitigation bank credits (HEG 2004a).

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)-Endangered. Construction of the Western Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2004a). No direct effects are anticipated because no breeding habitat would be altered under this alternative. Indirect impacts may result from disturbance of approximately 0.14 acres (0.06 ha) of Deciduous Riparian habitat that may be used by migratory individuals (HEG 2004a) for temporary roosting or foraging. Disturbed cottonwood and willow habitat within this area would be mitigated at a 2:1 ratio. Thus, this disturbance would be unlikely to adversely affect the species because it would be small in area and temporary in nature.

Sonora Chub (*Gila ditaenia*)-Threatened. Construction of the Western Corridor may affect, but is not likely to adversely affect the Sonora chub (HEG 2004a). No individuals would be directly impacted under this alternative because no construction activities would occur within occupied streams. Construction of

the Western Corridor may, however, affect, and is likely to adversely affect, the Sonora chub indirectly through the transport of sediments into Casita Spring and upper Sycamore Canyon. These indirect effects would not be expected to rise to the level of take because BMP erosion control measures would be used to minimize sediment transport (HEG 2004a).

Similarly, no critical habitat for Sonora chub would be directly impacted by project construction. The project is located 1 mi (1.6 km) upstream of Sycamore Creek and Hank and Yank Spring, the closest designated critical habitat. There would be no adverse modification or destruction of Sonora chub critical habitat because of the distance from project structures, and because BMPs would be in place to minimize erosion (HEG 2004a).

USFS Sensitive Species. Construction of the transmission line in the Western Corridor may adversely impact 31 of the 40 USFS sensitive species potentially occurring there (Table 4.3–5). However, with the exception of supine bean, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a). Surveys for supine bean are recommended to determine potential impacts under this alternative. Surveys for supine bean would need to be conducted prior to construction in potential supine bean habitat (HEG 2004a). If populations are found in the vicinity of construction, consultation with USFS biologists would be initiated to determine appropriate mitigation to avoid impacts that would result in a trend toward listing under the ESA or loss of population viability. Once surveys and additional consultation are completed, if impacts are not limited to individual plants, mitigation measures would be developed to prevent impacts to the whole populations. Therefore, impacts are not likely to result in a trend toward Federal listing or loss of viability.

BLM Sensitive Species. Individuals of 12 BLM sensitive species (see Section 3.3.3.1) potentially occurring in the Western Corridor could be adversely impacted. Specific impacts have not been evaluated because of insufficient survey information. However, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a).

Wildlife of Special Concern in Arizona. Effects of construction of the transmission line in the Western Corridor on the majority of the Wildlife of Special Concern in Arizona (see Section 3.3.3.1)would be avoided or minimized through mitigation efforts stipulated for federally listed species. No adverse impacts would be expected to six of these 11 species (HEG 2004a). Because no construction would occur in perennial aquatic habitats, there would be no adverse impacts to the black-bellied whistling duck and the osprey. There would also be no adverse impacts to the crested caracara, Mexican vine snake, rose-throated becard, and thick-billed kingbird because known populations occur outside the project area. Construction may adversely impact individuals of the other five species, but these impacts are not likely to result in trend toward listing or loss of population viability. Because five Sonoran Desert tortoises were located during field surveys of the proposed right-of-way (ROW), additional mitigation is recommended for that species.

Arizona Department of Agriculture Plants. Construction of the transmission line in the Western Corridor may adversely impact all of the five plant species listed by the ADA (see Section 3.3.3.1) that potentially occur there. Specific impacts have not been evaluated because of insufficient survey information. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2004a).

Total number of special status species impacted. Construction of the transmission line in the Western Corridor may adversely impact 10 species listed under the Federal ESA, 31 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 5 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive

species). Thus, 59 different special status species may be adversely impacted by construction in this corridor.

4.3.3.2 *Central Corridor*

ESA Listed Species

Impacts to 7 of the 27 species listed by USFWS would occur under this alternative. Impacts to the following six species would be the same as those described under Section 4.3.3.1 cactus ferruginous pygmy-owl, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, and Pima pineapple cactus. Impacts to southwestern willow flycatcher are described below.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)-Endangered. Construction of the Central Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2004b). Similar to the impacts described in Section 4.3.3.1, no direct effects to breeding habitat would be anticipated because no breeding habitat would be altered under this alternative. Indirect impacts would be unlikely to result from disturbance of Deciduous Riparian habitat where the proposed transmission line crosses Peck Canyon. This habitat is patchy and lacks surface water; thus, it likely would not be used as habitat by migratory individuals of this species (HEG 2004b).

The Central Corridor would pass within 0.5 mi (0.8 ha) of the Santa Cruz River where migratory southwestern willow flycatchers have been documented (HEG 2004b). It is possible that noise from helicopter flights associated with construction activities would disturb southwestern willow flycatchers using suitable habitat along the Santa Cruz River. Any increase in noise would, however, be short term and minimal because of ambient noise levels from nearby Interstate 19. Therefore, the species would not likely be adversely affected (HEG 2004b).

USFS Sensitive Species. Construction of the transmission line in the Central Corridor may adversely impact 26 of the 42 USFS sensitive species (Table 4.3–5) that potentially occur in this corridor. Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM sensitive species would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Wildlife of Special Concern in Arizona. Impacts to Wildlife of Special Concern in Arizona would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants. Construction of the transmission line in the Central Corridor may impact six plant species listed (see Section 4.3.3.2) by the ADA as potentially occurring there. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability.

Total number of special status species impacted. Construction of the transmission line in the Central Corridor may adversely impact 7 species listed under the Federal ESA, 26 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 6 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive species). Thus, 51 different special status species may be adversely impacted by construction in this corridor.

4.3.3.3 *Crossover Corridor*

ESA Listed Species

Impacts to 9 of the 27 species listed by USFWS would occur under this alternative. Impacts to the following nine species would be the same as those described under Section 4.3.3.1: cactus ferruginous pygmy-owl, Chiricahua leopard frog, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Pima pineapple cactus, and southwestern willow flycatcher.

USFS Sensitive Species. Construction of the transmission line in the Crossover Corridor may adversely impact 28 of the 43 USFS sensitive species potentially occurring there (see Table 4.3–5). Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM sensitive species would be similar to those described under Section 4.3.3.1 (HEG 2004c).

Wildlife of Special Concern in Arizona. Impacts to Wildlife of Special Concern in Arizona would be similar to those described under Section 4.3.3.1 (HEG 2004b).

Arizona Department of Agriculture Plants. Impacts would be the same as those described under Section 4.3.3.2.

Total number of special status species impacted. Construction of the transmission line in the Crossover Corridor may adversely impact 9 species listed under the Federal ESA, 28 USFS sensitive species, 13 BLM sensitive species, 5 species listed as Wildlife of special concern in Arizona, and 6 plants listed by the Arizona Department of Agriculture (all of these plants are also listed by the USFS as sensitive species). Thus, 52 different special status species may be adversely impacted by construction in this corridor.

4.3.3.4 *115-kV Interconnection of the Gateway to Valencia Substations*

Potential habitat for seven threatened, endangered, or sensitive species of plants and animals is present in the vicinity of the proposed transmission line interconnection (see Section 3.3.3.4). However, impacts to these species or their habitats are not expected to be significant because of the potential to avoid direct disturbance of such habitats. Additional surveys for cactus ferruginous pygmy-owl, lesser long-nosed bat, and Pima pineapple cactus would be conducted before construction began following specified protocols. Appropriate mitigation measures would be implemented according to state and federal guidelines to minimize potential disturbances to special status species and habitats.

4.3.3.5 *No Action Alternative*

There would be no impact to special-status species associated with the No Action Alternative. The existing conditions as described in Section 3.3.3 would continue.

4.3.4 Migratory Birds and Raptors

Local movements of birds are difficult to predict since they vary seasonally and annually and are often linked to climatic conditions. For this reason, the number of potential collisions with towers and/or transmission lines cannot be specifically quantified or predicted. Habitat adjacent to specific portions of each of the corridors determines bird abundance and the species present within that portion of the corridor

(SWCA 2004). The estimated acreage of vegetation available to migratory birds is provided in Section 3.3.2.

Some mortality resulting from bird collisions within the transmission line corridor is considered unavoidable. However, anticipated mortality levels are not expected to result in long-term loss of population viability in any individual species or lead to a trend toward listing under the ESA for any of the proposed corridors because mortality levels are anticipated to be low and spread over the life of the transmission line. Electrocution is not expected to be a substantial hazard because the lines would be spaced wider than the largest local raptor's (golden eagle) wingspan. Furthermore, TEP would follow the guidelines outlined in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in 1996* (APLIC 1996). None of the towers are anticipated to require lights for aircraft avoidance, which has been associated with nighttime collisions (Kerlinger 2000).

Additional impacts to birds listed under the *Migratory Bird Treaty Act* would include impacts to vegetation, an important habitat component. Some areas would be cleared entirely to facilitate construction; in other areas, vegetation may be crushed but left onsite; and in other areas, relatively minimal disturbance would occur due to helicopter placement of towers. At the conclusion of construction, temporary access roads would be closed and revegetated; however, maintenance of the transmission line would require some permanent access roads. In addition, some tall trees and shrubs may need to be removed in portions of the corridor to allow maintenance access.

4.3.4.1 *Western, Central, and Crossover Corridors*

Potential direct and indirect effects to migratory birds and raptors as a result of the proposed project could include:

- Increased anthropogenic (manmade) noise and visual disturbances during construction
- Disturbance to and loss of foraging, cover, and nesting habitats related to removal of vegetation during construction
- Direct mortality due to collisions with equipment during construction and during maintenance activities after construction is complete
- Increased probability of mortality or harm due to collisions with towers and lines
- Temporary loss of prey during construction
- Reduction in the amount of foraging, cover, and nesting habitats for various species
- Permanent degradation and fragmentation of habitat for various species related to construction of the line and potential for introduction and colonization by nonnative species
- Displacement of some species (including prey base species) that could result in increased competition for resources in nearby populations

Increased perch site for raptors during nesting and hunting and increase in potential nest platforms. This may lead to an imbalance in the prey base due to increased utilization by one or more raptor species. Additionally, some studies have confirmed that some species (grassland birds) abandon habitat within 1 mi (1.6 km) or more of tall artificial structures.

4.3.4.2 *No Action Alternative*

There would be no impact to migratory birds and raptors associated with the No Action Alternative.

4.3.5 Coronado National Forest Management Indicator Species

Implementation of the proposed project has the potential to adversely impact Management Indicator Species (MIS) that occur within the Tumacacori EMA of the Coronado National Forest by both direct and indirect impacts. Potential direct impacts include direct mortality or harm and removal of foraging, cover, and breeding habitats during construction. Indirect impacts include degradation of habitats including an increase in fragmentation, displacement of wildlife into nearby populations resulting in increased competition for resources, and an increased probability of roadkills and tower strikes by bird species.

Potential nest sites within the Coronado National Forest that could be affected by this project are present throughout each of the proposed corridors. Direct effects would involve disturbance of nesting birds as a result of construction activities and the loss of cavity-bearing trees within construction zones. No blasting would occur during the peak breeding times for migratory birds (April – August) in order to minimize impacts to migratory birds (see Section 4.3.2). Impacts to this group could occur as result of clearing trees large enough to accommodate nest cavities.

Within the Western Corridor an estimated 95 acres (38 ha) of Madrean evergreen woodland and 0.3 acre (0.12 ha) of riparian vegetation would be lost or modified as a result of construction activities. Within the Central Corridor, an estimated 38 acres (15.4 ha) of woodland and 0.1 acre (0.04 ha) of riparian habitat would be lost or modified. Within the Crossover Corridor, an estimated 72 acres (26 ha) of woodland and 0.05 acres (0.026 ha) of riparian vegetation would be lost or modified (Tables 4.3-1, 4.3-2 and 4.3-3). These figures represent less than 0.001 percent of the available woodland and riparian habitats in the Tumacacori EMA. The least amount of disturbance of potential habitat would occur by selecting the Central Corridor. However, in light of the large amount of available habitat in the project area, the differences between alternatives would likely be insignificant in terms of impacts to cavity nesters.

Avoidance of large trees and saguaros during the site selections for the location of the towers and access roads would minimize any reduction in the number of potential cavity sites that are available for this species group. The potential effects under any of the three alternatives are not expected to result in changes in population trends for cavity-nesting species forest-wide. The amount of habitat lost or modified would be small compared to the total available in the EMA. Further, suitable forest, woodland and riparian habitats are abundant throughout the Forest and are sufficient to maintain viable populations of cavity nesters throughout the Forest.

Summary of MIS Impacts. Implementation of the proposed alternatives has the potential to affect Management Indicator Species as a result of both direct and indirect impacts. Direct impacts would include the potential for direct mortality, displacement or disturbance of individuals as a result of construction-related disturbance and long-term maintenance activities. Indirect effects include small changes in habitat suitability for some species as a result of woody vegetation, and potential increases in erosion into riparian habitats as a result of ground disturbance. There would be an increased probability of bird strikes with transmission lines and towers. The direct, indirect and cumulative impacts would be mitigated by design and construction features designed to minimize impacts.

For all species considered, no downward population trends are expected for one or more of the following reasons: 1) viable populations are present elsewhere in the Tumacacori EMA or within other suitable habitats elsewhere on the Forest; 2) only a small percentage of the species population or habitat would be affected; or 3) known populations in the project area would not be affected by project activities.

4.3.6 Invasive Species

Colonization of land by invasive species typically occurs gradually and inconspicuously. By the time that public awareness develops, the effects are often irreversible, and resources may be irretrievably committed, productivity lowered, and biodiversity reduced (BLM 1994, Nelson 1995). The expansion of the range of invasive species is largely caused by human activities, which disturb native ecosystems (Sheley 1994, BLM 1994, Harrod 1994). Vegetation removal and ground-disturbing activities create opportunities for colonization by alien plants (Orians 1986, Bazzaz 1983). Additionally, the transportation of seeds can occur inadvertently through human activities or livestock grazing (Nelson 1995). Colonization of invasive species may result in significant ecological effects by disrupting the natural functions and values of an ecosystem.

4.3.6.1 *Western, Central, and Crossover Corridors*

All action alternatives would require clearing of land for access roads, tower pads, and lay down areas, as described in Section 4.1, Land Use. Impacts of the alternatives are described by the area of anticipated new disturbance associated with construction of new access roads, poles locations, and lay down pads. New disturbances would provide a potential point of entry onto the landscape, which could lead to colonization of undisturbed surrounding land. Measures outlined in the Invasive Management Plan (see the Biological Assessments in Appendices D, E, F, and K of this EIS) would minimize the introduction and spread of invasive species. Furthermore, invasive species within the Coronado National Forest would be managed per the decision made in the Decision Memo/Finding of No Significant Impact for the Environmental Assessment for the Invasive Exotic Plant Management Program (CNF 2004b).

4.3.6.2 *No Action Alternative*

No new ground disturbance would occur; therefore, no invasive species would colonize any of the proposed routes as a result of the No Action Alternative. Existing conditions described in Sections 3.3.6 would continue.

Table 4.3–6. Comparison of Potential Impacts to Habitat Within Coronado Forest Lands for Management Indicator Species for Each Alternative[a]

Alternative	Cavity Nesters	Riparian Species	Species Needing Diversity	Species Needing Herbaceous Cover	Game Species
Western Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 95 acres of Madrean evergreen woodland, 0.6 acres of desert riparian scrub, and 3 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.6 acres of desert riparian scrub and approximately 3 acres of deciduous riparian habitats.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Central Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 38 acres of Madrean evergreen woodland, 0.1 acres of desert riparian scrub, and 0.05 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.1 acres of desert riparian scrub and an estimated 0.05 acres of deciduous riparian habitats.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Crossover Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 72 acres of Madrean evergreen woodland.	Disturbance or loss of approximately 20 acres of desert riparian scrub and an estimated 0.05 acres of deciduous riparian habitats.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.

[a] Estimates of potential impact are based on an estimated 125-ft (38-m) wide construction corridor. In some areas, access would be attained through the use of helicopters, and placement of the towers would require fewer disturbances to habitat.

4.4 CULTURAL RESOURCES

This section discusses the potential adverse effects on cultural resources associated with the construction and operation of the proposed action and each alternative. This section also addresses potential Native American concerns.

4.4.1 Archaeological and Historical Sites

This section discusses the potential adverse effects on archaeological and historical sites associated with the construction of transmission lines and associated access roads within the three alternative corridors. Construction of transmission line structures and associated access roads has the potential to adversely affect archaeological and historical sites, based on the area of land disturbed, as described in Section 4.1, Land Use, and Section 4.12, Transportation. Access roads would be placed to avoid or minimize impacts to archaeological and historical sites. It is anticipated that additional cultural resources exist within all of the corridors. The Federal agencies are developing a Programmatic Agreement with the Arizona State Historic Preservation Office (SHPO), interested tribes, and TEP guiding the treatment of cultural resources if an action alternative is selected. Inventory, evaluation, and treatment of cultural resources would be in accordance with the terms specified in the Programmatic Agreement regarding Historic Properties. Prior to ground-disturbing activities in any approved corridor, a complete on-the-ground inventory would be conducted by professional archaeologists in accordance with provisions of Section 106 of the National Historic Preservation Act (NHPA). Efforts to identify cultural resources would also include historical document research and continued consultation with Native American tribes regarding potential traditional cultural properties and sacred sites. Identified cultural resources would be evaluated in terms of National Register eligibility criteria and potential project effects in consultation with all parties to the Programmatic Agreement.

Wherever possible, power poles, access roads, and any other ground-disturbing activities would be placed to avoid direct impacts to cultural resources. A professional archaeologist would assist the pole-siting crew in avoiding impacts to cultural resource sites. In cases where avoidance of sites is not feasible, a site-specific Treatment Plan and Data Recovery Plan would be developed in consultation with tribes, the, appropriate land- managing agencies, and the Arizona SHPO. These plans will include an appropriate Plan of Action to implement the Native American Graves Protection and Repatriation Act. A Discovery Plan would be developed to establish procedures to be followed in the event of discovery of unanticipated cultural resources, and a Monitoring Plan would address issues of site protection and avoidance.

Avoidance of cultural resources would be the primary means of mitigation: where possible, transmission line structures, access roads, and other ground-disturbing activities would be located so as to avoid cultural resources and preserve them in place. There is a high probability for site avoidance in areas where site density is expected to be low, such as in upland areas away from the Santa Cruz River. In cases where avoidance would not be feasible, site-specific mitigation plans would be developed.

4.4.1.1 *Western Corridor*

Twenty-two previously identified archaeological and historical sites have been documented within the Western Corridor. As described in Section 3.4.1, less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous areas of the Tumacacori and Atascosa Mountains (see Figure 1.1–4), it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Although less studied, the mountainous segment may contain Native American rock art sites, rock

shelters, and shrines, as well as Historic Period ranching and mining related sites. Valleys between mountains are expected to contain a wide variety of prehistoric and historic sites. The Atascosa Lookout Tower, an historic property outside the ROW northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4), would have visual impacts as portions of the Western Corridor would be visible from this location, altering the visual character of the area (also see Section 4.2, Visual Impacts).

4.4.1.2 *Central Corridor*

Six archaeological and historic sites have been documented within the Central Corridor. As described in Section 3.4.1, less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. Previous investigations have focused more on areas along the Santa Cruz River where site densities are generally high. Few previous archaeological studies have taken place along the central portion of this corridor south of Amado. Because the central portion of this corridor lies close to the Santa Cruz River, there is a high likelihood for the discovery of previously unrecorded sites.

Much of this alignment (including Option 2, but not Option 1) follows or crosses an existing EPNG pipeline alignment. Keeping construction activities to previously disturbed areas limits adverse impacts to cultural resources. Therefore, it is likely that Option 1 has the potential to cause greater impacts to cultural resources than Option 2, which follows the existing EPNG pipeline. The visual impacts to nearby historical sites such as the Tumacacori Mission Historic District in Tumacacori, the Tubac Presidio State Historic Park in Tubac, and the Juan Bautista de Anza National Historic Trail immediately adjacent to the Santa Cruz River in the proposed project area (see Figure 1.1–4) would be minimal. The I-19 area is already significantly altered from its previous state, and the proposed project would not reduce the Scenic Integrity of the area (see Section 4.2, Visual Impacts). Impacts to views from the historic parks in Tumacacori and Tubac would be minimal. Currently, views from both sites are blocked largely by vegetation, structures, I-19, and topography. It is unlikely that the proposed transmission line would be seen from either site (see the report, "Proposed TEP Powerline - Visibility from Tumacacori and Tubac Historic Sites" in Appendix I for more information).

4.4.1.3 *Crossover Corridor*

Twenty-seven archaeological and historic sites have been documented within the Crossover Corridor. As described in Section 3.4.1, less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous portions of this corridor, it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Peck Canyon, in particular, may contain a high density of sites. Although less studied, the mountainous segment may contain previously unrecorded Native American rock art sites, rock shelters, and shrines, as well as Historic Period ranching and mining related sites. The Crossover Corridor may be visible in the background (approximately 5 mi [8 km] away) from the Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4). The visual impact on this location would be minimal as the character of the area would not be significantly altered (also see Section 4.2, Visual Impacts). It is likely that option 1 has the potential to cause greater impacts to cultural resources than option 2, which follows the existing EPNG pipeline.

4.4.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential for impacts to cultural resources associated with the construction and operation of the Gateway to Valencia 115-kV transmission line corridor would be significantly less than the impacts presented for the Western, Central, and Crossover Corridors. The Gateway to Valencia transmission line

corridor would be less than one-tenth the length of the shortest proposed corridor, would require less than one-tenth as much construction, and is expected to contain fewer cultural resources due to past development within the corridor.

4.4.1.5 *Archaeological and Historic Site Impact Summary*

It is very likely that as yet unreported cultural resources would be discovered in each corridor. Based on the varied terrain, a wide range of archaeological site types is expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segments may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining-related sites. Intermontane valleys may contain a wide variety of prehistoric and historic sites (Gillespie and Spoerl 2004).

Within the Coronado National Forest, the Crossover Corridor has the highest density of known archaeological sites. Compared to other areas in the Tumacacori Mountains, the density of archaeological sites in Peck Canyon is very high and it is likely that a large number of unreported cultural resources would be located in this corridor.

Outside the Forest, the expectation based on known distribution of archaeological sites is that the Central Corridor will have the greatest complexity of cultural resource issues, given the long history of settlement in the Santa Cruz Valley. The Central Corridor also passes in the vicinity of Tumacacori National Historic Park and Tubac Presidio State Historic Park. All three alternatives cross lower Sopori Wash where extensive archaeological sites may be difficult to avoid.

In summary, it appears that the Crossover Corridor will contain the highest density of archaeological and historical sites and is the corridor where site avoidance and preservation in place will be the most difficult. The Central Corridor would likely be the least sensitive in terms of significant archaeological and historical sites on the Forest, but most sensitive off the Forest (USFS 2004).

4.4.1.6 *No Action Alternative*

Under the No Action Alternative, no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and Bureau of Land Management (BLM) would still allow access to public lands, and that could result in the discovery and/or the destruction of cultural sites.

4.4.2 Native American Concerns

4.4.2.1 *Western Corridor*

Indian tribal representatives have expressed opposition to this corridor, but have not (to date) named specific locations of any traditional cultural properties (TCPs) or sacred sites. Several tribes (Tohono O'Odham Nation, Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima Maricopa Indian Community and the Pascua Yaqui Tribe) have stated that they value the landscape through which the Western Corridor passes.

4.4.2.2 *Central Corridor*

The tribes have not identified any specific TCPs along this corridor to date. On the January 2002 site visit, representatives of several tribes (Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa Indian Community, and the Pascua Yaqui Tribe) stated that they would prefer that the project be constructed along the Central Corridor, if it was built at all. They view the Central Corridor

as an already-disturbed area. None of the tribes wished to express approval of the project overall when stating this preference. Similar statements favoring the Central Corridor, if any is to be built, were made in January 2003 meetings and a site visit (February 4, 2003) with Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa, and Ak Chin Indian Communities. The Hopi Tribe has expressed opposition to the Central Corridor because of the expected high density of important archaeological sites there.

4.4.2.3 *Crossover Corridor*

This alternative has been presented to tribal representatives from the Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities (SWCA 2002c). Official tribal concerns have not yet been stated, and no specific TCPs have yet been identified along this corridor by any tribes consulted.

4.4.2.4 *No Action Alternative*

Under the No Action Alternative no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and BLM would still allow access to public lands, which could result in the discovery and/or the destruction of cultural sites.

4.4.2.5 *Native American Concerns Summary*

Seven of the 12 tribes contacted expressed interest or concern about the project. Field reviews and meetings took place during preparation of the DEIS. Little site or area-specific information was provided by tribes (USFS 2004a).

The three corridors lie within traditional lands of the Tohono O'odham Nation, Gila River Indian Community, AkChin Indian Community, and Salt River Pima-Maricopa Indian Community. These tribes, often known as the Four Southern Tribes for purposes of cultural considerations, participated in field reviews and meetings. The Tohono O'odham Nation is considered the lead for this project.

Tohono O'odham Nation (and the three tribes deferring to them) opposes the Western Corridor and the Crossover Corridor because of concerns over the cultural and ethnographic landscape and the lack of disturbance in these areas. If a transmission line must be built, the Central Corridor is considered acceptable although they prefer the No Action Alternative.

The Hopi Tribe prefers the No Action Alternative. They consider the Central Corridor the least acceptable because of the higher density of cultural resource sites in the Santa Cruz River Valley.

Other tribes expressing concerns, although not as specific as the above, are the Pascua Yaqui Tribe and Mescalero Apache Tribe (USFS 2004a).

The Preliminary Native American Consultation has been completed. However, further consultation under Section 106 of the National Historic Preservation Act will be conducted after the issuance of the Record of Decisions (RODs), during siting of the transmission line and the conduct of archeological surveys.

4.5 SOCIOECONOMICS

Any sudden influx of capital or employment, such as a large construction project, to a region will impact the existing socioeconomic environment to some degree. The response of socioeconomic factors, such as employment, income, population, housing, and community services are interrelated. This section describes the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project on the existing socioeconomic environment of the region of influence (ROI) for Pima and Santa Cruz Counties.

Methodology

Socioeconomic impacts are addressed in both direct and indirect impacts. Direct impacts are changes that can be directly attributed to the proposed action, such as changes in employment and expenditures from the construction and operation of the proposed action. Indirect impacts to the ROI occur based on the direct impacts from the proposed action. For example, for this analysis, the term "direct jobs" refers to the employment created by the project and "direct income" refers to project workers' salaries. The term "indirect jobs" refers to the jobs created in other employment sectors as an indirect result of new employment at the construction site and "indirect income" refers to the income generated by the new indirect jobs. Two factors indirectly lead to changes in employment levels and income in other sectors throughout the ROI: (1) the changes in site purchase and non-payroll expenditures from the construction and operation phases of the project, and (2) the changes in payroll spending by new employees. The total economic impact is the sum of the direct and indirect impacts.

The direct impacts estimated in the socioeconomic analysis are based on project summary data developed by the U.S. Department of Energy (DOE) in conjunction with TEP's contractors and representatives. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System multipliers developed specifically for the TEP Sahuarita-Nogales Transmission Line Project ROI by the U.S. Bureau of Economic Analysis (BEA). BEA is part of the U.S. Department of Commerce's Economics and Statistics Administration and is responsible for providing Gross Domestic Product and economic accounts data for the country. These multipliers are developed from national input-output tables maintained by BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the United States. The multipliers for this analysis were developed from the input-output tables for the two counties comprising the ROI. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels.

During the public scoping process for the Draft Environmental Impact Statement (EIS), several commentors expressed concern that existence of the proposed transmission line would negatively impact real property values. In this context, any decrease in property values would be a perception-based impact, that is, an impact that does not depend on actual physical environmental impacts resulting directly from the proposed project, but rather upon the subjective perceptions of prospective purchasers in the real estate market at any given time. Courts have long recognized that such subjective, psychological factors are not readily translatable into quantifiable impacts. See, for example, *Hanly v. Kleindienst*, 471 F.2d 823, 833 n.10 (2d Cir. 1972), *cert. denied*, 412 U.S. 908, (1973). People do not act consistently in accordance with negative perceptions, and one person's negative perception might be another's positive. Also, perceptions of value may change over time, and perceptions of value are affected by a host of other factors that have nothing to do with the proposed project. Accordingly, any connection between public perception of a risk to property values and future behavior would be uncertain or speculative at best, and therefore would not inform decision making.

There have been studies of the impact of transmission lines and property values in other geographic areas. See, for example, discussion of these studies in the *Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project* (DOE 2002). Based on these studies, DOE can conclude only that, at worst, it is possible that there might be a small negative economic impact of short duration to some properties from the project, and that the impact on value would be highly variable, individualized, and unpredictable. The studies at most conclude that other factors, such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of residential real estate.

Accordingly, while DOE recognizes that a given property owner's value could be affected by the project, DOE has not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

The importance of the actions and their impacts is determined relative to the context of the affected environment, or project baseline, established in Section 3.5. The baseline conditions provide the framework for analyzing the importance of potential economic impacts that could result from the project.

4.5.1 Western, Central, and Crossover Corridors

The construction costs of each of the three action alternatives would be roughly similar, approximately $70 million plus or minus $7 million. The labor costs would be approximately the same regardless of the alternative selected, and each route would require approximately the same average and peak workforce and the same period of time to construct (TEP 2003). The majority of the impacts to regional social and economic resources would be directly attributable to the size of the workforce and the total income earned. The number of jobs and amount of income indirectly created by a project is determined by the amount of new direct income spent within the ROI. The model analyzes the financial transfers associated with the action and provides the impacts in terms of income and employment. Therefore, the majority of the socioeconomic impacts from each alternative would be the same. The differences in overall project cost would affect the amount of tax revenue generated by each alternative. The greatest amount of tax revenue would be generated by the Crossover Corridor, while the Central Corridor would generate the least amount of tax revenue for local communities.

As discussed above, the majority of the socioeconomic impacts from each alternative would be the same. The construction of the proposed transmission line, the modification of the existing South Substation, and the construction of the new Gateway Substation would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. The project is currently scheduled to be completed 12 to 18 months after construction begins. The most recent data available indicate that the average annual salary for construction workers employed in electrical transmission line construction within the ROI was $38,327 (CBP 1999a). Total new direct income generated by the proposed transmission line construction would range from an estimated $1.7 million to $2.9 million. The final figure would depend on the duration of peak workforce employment. Should the average level of 30 individuals be used throughout, the amount of new direct income would be an estimated $1.7 million. For each month that peak construction levels of 50 individuals are employed, total new direct income would increase by an estimated $64,000. The scenario generating the greatest economic benefit to the ROI would be employment of peak construction levels for the 18-month duration of the project. In this scenario, an estimated $2.9 million in new direct income would be generated.

The average number of direct jobs created by the project, 30, would lead to the indirect creation of approximately 31 additional jobs in other sectors throughout the ROI for the duration of the project. The majority of these new indirect jobs would be created in the service and retail sectors of the local economy as most of the disposable income generated by the project would be spent in these sectors. Peak

construction levels of 50 workers could increase the number of indirect jobs created to 52; however, the short duration of construction and the inherent temporary nature of the use of peak workforces would most likely keep the number of indirect jobs created closer to 31. These new indirect jobs would generate an additional $1.5 million in income during the 18-month construction period. New indirect income could reach a maximum of $2.6 million, should peak construction levels be used for the full duration of the project.

Depending on the length of time that peak construction levels are utilized, the total number of jobs created by construction of the TEP Sahuarita-Nogales Transmission Line Project would range from 61 to 102 jobs. The total income generated by the project would be at least $3.2 million with the maximum possible being $5.5 million. The additional revenue would benefit the region with an influx of capital.

Though the unemployment levels of the ROI are comparatively low at 3.2 percent, no difficulties would be experienced in filling the jobs generated by this project. The unemployment level for Santa Cruz County is 13.8 percent, which is very high, and the majority of the jobs could be filled from unemployed residents of this county. Also, the size of the workforce throughout the ROI shows that approximately 12,750 people are unemployed, which is sufficient to fill the maximum of 102 jobs that could be created by this project. Therefore, it is expected that no permanent influx of population to the ROI would be required to staff the jobs generated by this project. Since no population influx is expected to result, no new stresses would be applied to community services in the area. Existing services would be sufficient to accommodate any needs generated by this project.

Upon completion of the construction, the construction workforce would no longer be employed by this project and all indirect jobs that would be attributable to the project would no longer exist. This would not be a problem, however, for two reasons. The first is that it would be a return to current employment levels in the ROI with the exception of the extra revenue generated by the project. The second is that construction, by nature, is a temporary form of employment. Construction workers only work on a job until the project is completed and then they move on to the next project.

Operation of the facilities would require between one and five employees for maintenance, including repairs, and inspection of the facilities. The inspection and maintenance work would only occur on an occasional basis and the employees required would already be employed in this capacity within the company. No new jobs would be generated, therefore no socioeconomic impacts are expected from the operation of the facility.

The presence of a new transmission line in the Coronado National Forest would impact current uses to a certain degree. Presently, the USFS generates revenue from goods and services generated from National Forest System lands and allocates 25 percent of that revenue to the State of Arizona under the 25 Percent Fund payments to states (PTS). USFS also provides Payment in Lieu of Taxes (PILT) to the state since Federal lands are not obligated to pay property taxes. The state then allocates the money to the counties based on the locations of the forests. Any impact to the Coronado National Forest that could affect the amount of revenue generated would affect the amount that counties receive from PTS and PILT. The proposed transmission line would increase revenue. This could have a minor influence on the overall revenue generated and slightly increase the amount the Pima and Santa Cruz Counties receive.

There is a potential for negative impacts to tourism-generated revenues in the project area as a result of the visual and recreational changes introduced by the project. This is especially true for the growing ecotourism industry in southern Arizona, which in the project area is focused primarily on birding. However, because there are so many factors that can affect tourism, it would be speculative to quantify any potential decrease in direct visitor spending or total direct economic impact to the project area as a result of the proposed project. Conversely, increased electrical reliability from the proposed project in

Santa Cruz County may also contribute to the area's ability to attract tourists, but a quantitative assessment of such impacts in this EIS would also be speculative. There would be no differences in socioeconomic impacts between options 1 and 2 for either the Central Corridor or the Crossover Corridor.

New Transmission Line ROW and Access Roads

The TEP construction alternatives include acquiring easements for approximately 57 to 65 mi (92 to 105 km) of a new 345-kV transmission line right-of-way (ROW). The new ROW would either follow existing utility corridors or be routed in a new corridor location and would be 125 ft (38 m) in width. TEP would utilize existing access roads where possible; however, it is anticipated that additional access road easements would need to be acquired for each corridor.

Affected landowners would be offered market value established through the appraisal process for the transmission line and/or access road perpetual easements. The appraisal process takes all factors affecting value into consideration including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to add support to valuation considerations. The strength of any appraisal is dependent on the individual analysis of the property, using neighborhood-specific market data to determine market value.

TEP's transmission line easements would encumber the ROW area with land use limitations. Typical transmission line easements require the right to clear the ROW and to keep it clear of all trees, brush, vegetation, other structures, and fire and electrical hazards. The landowner can usually grow most crops with certain height restrictions or graze livestock. Tree and crop height and access to the ROW must be controlled to maintain safe distances.

The impact of introducing a new ROW for transmission towers and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and location of existing improvements. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property (severance damage). Whether a transmission line introduces a negative visual impact is dependent on the placement of the line across a property as well as each individual landowner's perception of what is visually acceptable or unacceptable.

If the transmission line crosses a portion of the property in agricultural use such as pasture or cropland, little utility is lost between the towers, but 100 percent of the utility is lost within the base of the tower. Towers may also present an obstacle for operating farm equipment, and controlling weeds at tower locations. To the extent possible, new transmission lines are designed to minimize the impact to existing and proposed (if known) irrigation systems. If the introduction of a transmission line creates a need to redesign irrigation equipment or layout, TEP would compensate the landowner for this additional cost. These factors as well as any other elements unique to the property are taken into consideration to determine the loss in value within the easement area, as well as outside the easement area in cases of severance.

If TEP acquires an easement on an existing access road and the landowner is the only other user, market compensation is generally 50 percent of full fee value or something less than 50 percent if other landowners share the access road use. For fully improved roads, the appraiser may prepare a cost analysis to identify the value of the access road easement. If TEP acquires an easement for the right to construct a new access road and the landowner has equal benefit and need of the access road, market compensation is generally 50 percent of full fee value. If the landowner has little or no use for the new access road to be constructed, market compensation for the easement is generally close to full fee value. If TEP acquires an easement of Federal or state land, TEP might be required to pay a usage fee. For National Forest System

lands, USFS typically assesses a use fee for authorizations to use a powerline ROW. USFS does not generally assess fees for the use of access roads crossing National Forest System lands to access a ROW.

4.5.2 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No changes to the existing employment levels would occur beyond the existing trends (described in Section 3.5); no new income or tax revenue would be generated beyond existing trends; and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the proposed project.

4.6 GEOLOGY AND SOILS

The geology and soil resource impact analysis consists of an evaluation of the potential effects generated by the construction and operation of the proposed project on specific geologic and soil resource attributes. Construction activities represent the principal means by which an effect to geologic resources (for example, limiting access to mineral or energy resources) and soil resources would occur. The principal element in assessing the effect on the geologic and soil resources is the amount and location of land disturbed during construction of the alternative, including proposed access roads, tower sites and construction areas, and project staging areas. The slope, depth below the ground surface to bedrock, and attributes of the soil within each corridor are evaluated to assess the potential construction techniques and the associated degree of land disturbance.

Methodology

Aerial and ground surveys of representative sections of each corridor were conducted to observe surficial soil and rock conditions (Terracon 2002). To determine if an action may cause a significant impact, both the context of the action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of the relative land area disturbance based on the required construction technique, and on any unique characteristics of the area (for example, mineral resources), and the degree to which the proposed project may adversely affect such unique resources.

Geology. Impact analysis on the geologic resource by the proposed project involves the evaluation of potential effects to critical geologic attributes such as access to mineral and energy resources, destruction of unique geologic features, vibratory ground motion induced by seismic activity, subsidence induced by groundwater withdrawal, and mass movement or ground shifting induced by the construction of facilities associated with an alternative. The impact analysis includes the analysis of large-scale geological conditions such as earthquakes, volcanism, and geological resources. These conditions tend to effect broad expanses of land and typically are not restricted to smaller discrete areas of land.

Soil. Impact analysis on the soil resource by the proposed project involves the evaluation of potential effects to specific soil attributes, such as increasing the potential for erosion and compaction by construction activities. Unlike the large scale geologic conditions discussed above, effects to the soil resource occur on discrete areas of land. Surface erosion is most prevalent in areas where a highly erodible material is exposed to concentrated surface runoff.

4.6.1 Geology

4.6.1.1 *Western Corridor*

The placement of the transmission line structures and access roads would require some disturbance and removal of near-surface material, as described in Section 3.6, Geology and Soils. In siting the proposed access roads and tower locations, Tucson Electric Power Company's (TEP's) preliminary design of the project avoids prominent topographic features (such as the Castle Rock outcrop south of Peña Blanca Lake, located as shown in Figure 3.2–2). Avoiding such prominent topographic features prevents scarring of the land, and contributes to mitigation of potential visual impacts (see Section 4.2, Visual Impacts).

Because of the low relief (relatively flat landform) of most of the northern portion of the Western Corridor, the potential for slope failure would be insignificant. However, in the mountainous areas in the southern portion of the corridor (primarily in the Coronado National Forest), as discussed in Section

3.6.1, Geology, there is potential for ground failure (for example, a landslide) where the corridor crosses steep mountain ridges. Relatively intact bedrock, which is not subject to ground failure, is near to or exposed at the ground surface along the majority of the Western Corridor on the west side of the Tumacacori Mountains. These conditions should be suitable for supporting poles on a rock bolted base, in which small holes (less than 6 in [15 cm] in diameter) are drilled into the bedrock and the tower is attached with large bolts. To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected. The Western Corridor would cross limited areas where significant soil horizons would be encountered, which would require direct embedment poles. This type of pole installation requires excavation of a shaft wider than the pole using a caisson-drilling rig, and then subsequent backfilling around the pole. In soils with large cobbles (rocks) or soils that tend to collapse, a large pit is often excavated, in which the pole is placed. In such cases, a lean-concrete slurry may be required for backfill of the pit because soils with large cobbles are difficult to compact adequately (Terracon 2002). However, the total land area disturbed by either construction method is similar (an approximate 100-ft [30.5-m] radius).

Based on the Roads Analysis (URS 2003a) required by the U.S. Department of Agriculture Forest Service (USFS) on National Forest System lands, the proposed roads that would be constructed by TEP for the Western Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

No sand or gravel mining occurs within the Western Corridor and no active surface mines are crossed. No impact to geologic resource availability would be expected from implementation of the proposed project.

The Western Corridor is located adjacent to inactive mine tailing areas west of Sahuarita (Township 17 South, Range 13 East). Since the proposed corridor alignments are within currently existing electric transmission corridor alignments in the vicinity of the mine tailing areas, it is not expected that the mine tailing areas would be expanded into these areas in the future. Therefore, no impact to the tailing areas would be expected from implementation of the proposed project.

Although seismic risk is low to moderate, given the seismic history of the area, locations of active faults and typical recurrence intervals discussed in Section 3.1, it is unlikely that the proposed project would be threatened significantly. However, design of the proposed project would take local seismic risk into consideration to mitigate any potential damage.

4.6.1.2 *Central Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Central Corridor.

Similar to the Western Corridor, because of the low relief (relatively flat landform) of most of the northern portion of the Central Corridor, the potential for slope failure would be insignificant. A majority of the Central Corridor near and on the Coronado National Forest (approximately 10 mi [16 km] on Quaternary alluvium, as shown in Figure 3.6–1) has exposed soil at the surface rather than bedrock. Foundations for structures along the Central Corridor in these areas would most likely require direct embedment poles. The unconsolidated gravelly and cobbly soils would make excavation of the embedment zone (hole) challenging, requiring excavation of a large pit. A lean-concrete slurry would likely be required for backfill of the pit because soils with large cobbles are difficult to compact

adequately. Where the southern portion of the Central Corridor intersects areas of relatively intact bedrock, rock bolting would be appropriate (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, the proposed roads that would be constructed by TEP for the Central Corridor would be on bedrock for approximately 15 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 85 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

Similar to the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Central Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage. There would be no significant differences in impacts between option 1 and option 2.

4.6.1.3 *Crossover Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Crossover Corridor.

In the vicinity of Peck Canyon and upon crossing other steep mountainous areas, as discussed in Section 3.6.1, Geology, there is potential for ground failure in areas where bedrock is not exposed. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. It would be expected that these conditions would be suitable for supporting rock bolted poles (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, the proposed roads that would be constructed by TEP for the Crossover Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

As for the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Crossover Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage. There would be no significant differences in impacts between option 1 and option 2.

4.6.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

There would no impacts to geological features or geologic resources of economic value in the immediate interconnection project area.

4.6.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Therefore, there would be no

potential impact to geologic resources. Current geologic conditions as described in Section 3.6.1, Geology, would continue.

4.6.2 Soils

4.6.2.1 *Western Corridor*

The soils of the project area would be impacted in areas of proposed access roads, support structure sites, construction areas, and project staging areas, as described in Section 4.1, Land Use. No cultivated areas would be disturbed. The major impact would occur during construction. An increased potential for erosion and soil compaction would occur as large equipment, including heavy trucks and cranes as listed in Section 2.2, are used to install the transmission line. Clearing of the right-of-way (ROW), where necessary, would decrease vegetation cover and may increase erosional factors, while extended and continued use of large equipment may compact the soil. Compaction of the soil can lead to rutting of the road surfaces.

Based on the Roads Analysis (URS 2003a) required by USFS for National Forest System land, for the Western Corridor, the new temporary area of disturbance during construction would be approximately 197 acres (78.5 ha), and the new permanent area of disturbance would be approximately 29.3 acres (11.9 ha). Information regarding site-specific conditions where individual roads are planned would be used during design and construction of the new roads to calculate and minimize erosion. Only spot repairs would be necessary on existing Forest System roads, as shown in Figure 3.12–1. Repairs of existing roads would likely have a positive impact because the upgrades would reduce erosion potential. On new proposed access roads, these soils would be compacted from vehicles and erosion potential could increase over the non-developed condition. In areas where slopes are mild, soil erosion impacts are expected to be minor.

In accordance with USFS "Soil and Water Conservation Practices Handbook" (USFS 1990), TEP has consulted with USFS regarding development of BMPs that would reduce or minimize impacts on geologic, soil, and water resources resulting from the proposed project. Additional consultation to determine specific BMPs would occur following determination of the specific routing location within a corridor if one is selected for implementation. Specific BMPs would be identified after coordination with the Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor. TEP's ongoing consultation with land owners and managers includes parameters for new road construction (URS 2003a). These road parameters include issues such as sideslopes, grades, water bars and rolling dips (to divert water off the roads), width, and road closure. Erosion control measures included in the BMPs would also address areas where slopes are such that soil erosion is a potential concern, and areas where wind related erosion is a concern.

The Western Corridor would cross soils considered to be prime farmland when irrigated. Although the exact placement of the structures cannot be determined at this time, much of the potential prime farmland soils would be spanned by the power line, as opposed to being directly converted to land within the structures footprint. As shown on Table 4.1–1, the estimated total footprint of the structures for the Western Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.2 *Central Corridor*

The expected impacts to soil resources and erosion control mitigation for the Central Corridor would be similar to those discussed above for the Western Corridor. The Central Corridor would disturb an area cultivated as permanent pasture for an estimated 0.5 mi (0.8 km) near where it crosses Sopori Wash (see

Figure 3.7–1). The primary difference from the Western Corridor would be in the area of land affected by construction and operation of the Central Corridor. For the Central Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be approximately 105 acres (42.5 ha), and the new permanent area of disturbance would be an estimated 23.1 acres (9.35 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Central Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Central Corridor is 0.21 acres (0.08 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.21 acres (0.08 ha).

4.6.2.3 *Crossover Corridor*

The expected impacts to soil resources and erosion control mitigation for the Crossover Corridor would be similar to those discussed above for the Western Corridor. No cultivated areas would be disturbed. The primary difference would be in the area of land affected by construction and operation of the Crossover Corridor. For the Crossover Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be an estimated 238.4 acres (96.5 ha), and the new permanent area of disturbance would be an estimated 36.4 acres (14.7 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Crossover Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Crossover Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Impacts to soils in the 115-kV interconnection project would be minimal. The major impact would occur during construction. Clearing of vegetation for the placement of transmission structures would decrease cover and increase the potential for erosion, while extended and continued use of large equipment may compact the soil. The design implementation details would be modified to account for the geotechnical soil conditions.

Since most of the land use in the interconnection project area is industrial, soils have been previously disturbed and therefore, there would be little to no impact to prime agricultural soils.

4.6.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No cultivated areas or prime farmland soils would be disturbed and erosion and resultant sediment transport would continue naturally in undisturbed areas.

4.7 WATER RESOURCES

This section discusses the potential impacts of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project to water resources in the project area for each alternative. The discussion is divided into potential impacts to surface water and groundwater.

4.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of floodplains and wetlands applies to all three proposed corridors. Information specific to surface water impacts and floodplains and wetlands impacts in the Western, Central, and Crossover Corridors is presented separately following the general discussion.

As the proposed location for the transmission line structures for any of the three alternatives is over 400 ft (122 m) from the U.S.-Mexico border, surface drainage would not be affected and no increase in volume, peak runoff, or flow, in either direction across the border would occur from the proposed construction.

Floodplains and Wetlands. A Floodplains and Wetlands Assessment, per Title 10, *Code of Federal Regulations* (CFR), Part 1022, *Compliance with Floodplain/Wetlands Environmental Review Requirements*, has been conducted for the proposed project and is included in Appendix C of this Final Environmental Impact Statement (EIS). A summary of potential impacts and mitigation follows; refer to Appendix C for more information.

The following discussion evaluates the potential impacts of each alternative to floodplains in the project area. No wetlands were found in the proposed corridors during field surveys and none have been identified by Forest Service (USFS) (USFS 2003). Additionally, because there are no major washes on BLM land, no wetland impacts are expected. There may be small areas of wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments. TEP would site the transmission line to avoid such areas. Therefore, no wetlands are expected to be impacted by the proposed project. The discussion of impacts to floodplains is organized by geographic area in order to take advantage of geographic overlap between the three corridor alternatives: Western, Crossover, and Central. These geographic areas are the North Segment, North Central Segment, South Central Segment, East-West Segment, South Segment, and the 115-kV interconnection (labeled on Figure 3.7–3). Common to all three corridor alternatives are the North Segment, the South Segment, and the 115-kV interconnection.

For the purposes of this assessment, the 500-year and 100-year floodplains along the Santa Cruz River and its tributaries were taken from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), which are based on 2002 digital FIRM files for Pima and Santa Cruz counties. The FIRM maps indicate that the following tributaries occurring in the project area could have associated 100-year floodplains: Santa Cruz River, Sopori, Toros, Diablo, Las Chivas, Mariposa Canyon Wash, and several unnamed washes (see Figure 3.7-3). Delineated 500-year floodplains within the study areas are associated with the Santa Cruz River, Sopori, and Mariposa Canyon Wash. Additional unmapped 100-year and 500-year floodplains may also occur in the project area. In those areas where the 100- or 500-year floodplains have not been delineated, the county engineer or Federal agency may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

All three proposed corridors involve some construction in floodplains. The four activities that would be conducted in floodplains are pole placement, the construction of pole laydown areas, access roads, and the South Substation expansion (located in the North Segment of all three corridors). For the purposes of this assessment, the following assumptions were made regarding these potential impacts: (1) the impact of individual pole placement would be 25 ft^2 (2.3 m^2) (see Table 4.1–1 for overall pole footprints); (2) pole

laydown areas would each require about 1,850 ft^2 (172 m^2); (3) access roads would be 12 ft (3.7 m) wide; and (4) the South Substation expansion would require 58,500 ft^2 (5,440 m^2). Projected impacts to floodplains were based on maps provided by Electrical Consultants Inc. showing locations of poles, pole laydown areas, and access roads (ECI 2003).

As permanent structures in floodplains, the South Substation expansion and corridor access roads could directly impact floodplain functions and values by increasing flood elevation and frequency. An increase in flood elevation could result in an increase in downstream flood loss and a long-term negative impact on lives and property. Impacts resulting from pole placement and construction of laydown areas would be negligible. Neither activity would negatively impact flood elevation or flood frequency. Consequently, there would be no direct or long-term effects on floodplain values or lives and properties.

Table 4.7–1 shows the estimated area of each proposed corridor that could be in the delineated 100-year and 500-year floodplain (refer to Appendix C for additional details). The Western and Crossover Corridors would have the greatest potential impact on floodplains in the project area. For these two alternative corridor routes, total potential impact within the delineated 100-year floodplain is estimated at about 1.97 acres (0.80 ha). The Central Corridor would have the least impact to the delineated 100-year floodplain (an estimated 1.58 acres [0.64 ha]).

Table 4.7–1. Estimated Impacts to Floodplains by Alternative.

Segment	Western (acres)	Crossover (acres)	Central (acres)
North	1.34	1.34	1.34
North Central	0.54	0.54	0.15
South Central	0.00	0.00	0.00
East-West	-	0.00	-
South	0.09	0.09	0.09
TOTAL	**1.97**	**1.97**	**1.58**

"-" means corridor does not pass through this segment.

Impacts to floodplains would be avoided to the extent possible by siting access roads and pole laydown areas outside floodplains, and spanning floodplains where feasible. Impacts to floodplains resulting from the South Substation expansion could result because the South Substation was originally constructed in the delineated 100-year floodplain. However, TEP completed a study to determine engineering measures that could be implemented to provide flood protection to the South Substation (TEP 2002c). The results of that study indicate a variety of protective measures (ranging from reducing erosion with soil cement to building a structural concrete retaining wall) that can be implemented to better protect the South Substation from flooding. TEP would take appropriate measures to maintain the reliability of the electric transmission system.

In the case of Sopori Wash (see Figure 3.7–3), for any of the three corridors TEP would place one structure within the 100-year floodplain, though outside the normal flow line, as this wash is too wide to span across. The structure would be engineered to withstand a 100-year flood. In addition, for the Crossover Corridor an estimated two structures would be placed in the bottom of Peck Canyon, as described in Section 4.7.1.3.

TEP would be required to comply with Pima and Santa Cruz County floodplain protection standards. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. In the project area, this would apply to the South Substation expansion and corridor access roads that cross the floodplain. The support structures,

though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary. Finally, obtaining a Floodplain Permit for this project would be contingent on concurrent acquisition of any *Clean Water Act* (CWA) Section 401 (state certification) and 402 (National Pollutant Discharge Elimination System) permits, if necessary.

Placement of roads within the floodplain can restrict transport of organic and inorganic materials, divert streamflow, and constrain natural channel migration. These factors can result in alteration or degradation of stream habitats, as well as physical damage to the landscape as a whole. Because the location and physical attributes of drainage channels are dynamic, appropriate placement of roads and other structures must account for movement of geomorphic (surface) features within the floodplain. Information regarding site-specific conditions on where proposed roads would approach floodplains would be used during the design and construction of these roads in order to ensure that the design best protects the integrity of channel and floodplain dynamics. Although flash floods could occur in narrow washes, they would not be expected to impact the transmission towers, as the towers would be located to span across such washes.

Surface Water. The following discussion describes potential surface water impacts and mitigation for each of the three proposed corridors. Surface waters include the tributaries identified in the previous section (Floodplains and Wetlands) that could be part of the 100-year floodplain.

4.7.1.1 *Western Corridor*

The Western Corridor would cross numerous dry washes, many very small, and approximately 15 large washes, both within and outside of the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, including one minor drainage on Bureau of Land Management (BLM) land. Potential impacts to surface waterbodies would be from increased erosion and subsequent siltation due to construction activities around these areas. Although the exact placement of the structures has not yet been identified, TEP would span the surface water features and avoid placing structures adjacent to surface water features where feasible, except as noted previously for Sopori Wash.

Access roads to the proposed project, both for construction and ongoing maintenance, would traverse numerous washes, including approximately 134 drainages and washes on the Coronado National Forest along the Western Corridor. Proposed access roads would be designed in accordance with Best Management Practices (BMPs) (and USFS guidance on National Forest System lands) to minimize impacts to washes (URS 2003a). Potential effects related to stream crossings include increased sedimentation, changes in stream morphology including substrate composition, and changes in the ability of the stream to support vegetation and wildlife. Because drainage along the corridor is intermittent and the road use would also be intermittent, roads would generally not need culverts or bridges where they cross streams. Therefore, stream crossings should not interfere with material transport (wood, fine organic matter, sediment) in streams. The road system could create a potential for pollutants (primarily from motorized vehicles) to reach surface waters, when water flow occurs at stream crossings in locations where road drainage flows directly into a stream. However, as the stream network is intermittent, road-stream crossings are limited, and expected vehicle use is infrequent, the potential for pollutants to enter surface waters as a result of the proposed project is negligible. All construction equipment would be refueled no closer than 500 ft (150 m) from a wash or drainage (URS 2003a).

Road effects on the surface and subsurface hydrology of a given area include potential diversion and concentration of flow. Road design including water bars, rolling dips, and hardened crossings would be developed in coordination with the land owners and managers.

TEP consulted with USFS regarding development of BMPs for minimizing impacts on geologic, soil, and water resources from the proposed project on National Forest System lands, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (FSH 2509.22, R-3 Transmittal, USFS 1990). Specific BMPs would be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, to mitigate potential impacts for the entire length of the selected corridor. BMPs would include standard erosion control methods such as silt fencing and hay bales in areas where erosion into surface water drainages could occur. For specific mitigation measures, see Table 2.2-2 Mitigation Common to All Alternatives.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

The potential impacts to surface waterbodies would be from increased erosion and subsequent siltation due to construction activities. Although the exact placement of the structures has not yet been identified, TEP would span surface water features and avoid placing structures adjacent to surface waterbodies where feasible. BMPs would be used to reduce impact to surface water bodies.

4.7.1.2 *Central Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Central Corridor. The Central Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 21 drainages and washes along the Central Corridor (URS 2003a). No significant differences in impacts are expected between options 1 and 2 because there are no significant water resources in this 1.9- mi (3.1-km) stretch of land.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.3 *Crossover Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Crossover Corridor. The Crossover Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. Two proposed towers within the Peck Canyon segment would be located in the bottom of the wash due to the steep terrain of the area limiting potential structure base locations. The tower foundations and associated sediment deposition and streambed vegetation could disrupt channel hydraulics during flood debris flow events. This would force flow against the valley walls, potentially resulting in increased erosion. The probability of this occurring should be evaluated in more detail if the Crossover Corridor is selected for construction (URS 2003a). On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 86 drainages and washes along the Crossover Corridor (URS 2003a). No significant differences in impacts are expected between options 1 and 2 because there are no significant water resources in this 1.9- mi (3.1-km) stretch of land.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply to the 115-kV interconnection. There would be structures located within the 100-year floodplain. TEP would be required to comply with Santa Cruz County floodplain protection standards. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. The support structures, though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary.

4.7.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. Current water resource patterns would continue, as described in Section 3.7.1.

4.7.2 Groundwater

4.7.2.1 *Western Corridor*

During construction of the project, water would be required primarily for dust control. Groundwater may be used, with the specific water sources to be determined upon precise siting of the right-of-way (ROW). It is estimated that approximately 1 acre-ft would be used during construction. This water would be obtained from various sources and aquifers within the project area. Although the exact sources are not known, removal of this minimal quantity of groundwater would not have a noticeable effect on groundwater supply in the region. For comparison, the total groundwater demand in the Santa Cruz Active Management Area in 2000 was 54,100 acre-ft.

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate clean-up of spills and leaks of hazardous materials. In this manner any potentially contaminating materials would be removed before they could migrate downward to the groundwater. In addition, the generally large depth to groundwater in the project area further limits the potential for groundwater contamination from surface spills. In the event of a spill, TEP would notify the appropriate state (ADEQ) and local officials, and the affected landowner, while initiating emergency response actions.

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with manufacturer's recommendations. Paint containers would be tightly sealed to

prevent leaks or spills. Excess paint would be disposed of consistent with the manufacturer's recommendations and according to applicable governmental regulations.

4.7.2.2 *Central Corridor*

The groundwater issues described for the Western Corridor also apply to the Central Corridor.

4.7.2.3 *Crossover Corridor*

The groundwater issues described for the Western Corridor also apply to the Crossover Corridor.

4.7.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The groundwater issues described for the Western Corridor also apply to the 115-kV Interconnection of the Gateway and Valencia Substations.

4.7.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for effects on local groundwater would be eliminated. Current trends in groundwater usage and subsidence would continue, as described in Section 3.7.2.

4.8 AIR QUALITY

This section includes discussion of the potential effects of the emissions of the proposed project on air quality, the conformity analysis required under the *Clean Air Act* (CAA), and the potential particulate matter contributions to the United States that could result from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The methodology for determining impacts is presented, along with a description of the construction and operation impacts for each alternative.

4.8.1 Emissions

Methodology

The air quality impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions that could occur during construction of each alternative from fugitive dust (dust which escapes from a construction site) and equipment exhaust. Potential air impacts are evaluated for both project construction in the U.S. and for impacts in the U.S. that could be caused by air emissions transported to the U.S. from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The projected construction progression, local climate and soil conditions, and project area land use are considered in assessing the significance of air quality impacts associated with the proposed project. Mitigation measures to avoid potential nuisance dust conditions and minimize construction equipment impacts to nearby residents are also described.

4.8.1.1 *Western Corridor*

The potential for impacts on air quality associated with the Western Corridor would occur primarily during the construction phase. Fugitive dust emissions would result from construction along the transmission line right-of-way (ROW) at the South and Gateway Substations and staging areas, and at other construction areas as described in Section 2.2.3, Transmission Line Construction. The major sources of dust emissions would be construction equipment traffic, land clearing, drilling, excavation, and earth moving. Tucson Electric Power Company (TEP) anticipates that some explosives blasting would be required depending on geological conditions. Dust emissions would vary substantially from day to day, depending on the level of activity, the specific operation, and the prevailing meteorological conditions. The use of construction equipment would also result in the emission of air pollutants associated with diesel combustion (NO_x [nitrogen oxides], CO [carbon monoxide], SO_x [sulfur oxides], PM_{10} [particulate matter with an aerodynamic diameter less than or equal to 10 microns] and reactive organic gases [ROG] from the fuel). All construction vehicle movements would be limited to the ROW or to pre-designated staging areas or public roads. Roads and active areas would have watering requirements appropriate for dust control in arid regions. An Activity Permit would be obtained from the Pima County Department of Environmental Quality for construction activities. The Arizona Administrative Code (AAC) contains dust control requirements for activities in Santa Cruz County, although no "dust control permit" would be required for activities in Santa Cruz County (Yockey 2001). Given the limited emissions of the project, it would not be subject to New Source Review (NSR) permitting under the CAA.

The Western Corridor crosses primarily undeveloped land. A limited number of residents in the vicinity of the ROW may be affected by a temporary adverse impact on their local air quality during construction. The average duration a construction site would be active adjacent to any one residence or business is 2 to 3 months. Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months. No air quality impact associated with construction at any Class I Areas, or impacts to overall climate, would be expected from the proposed project. Construction generated dust would settle out of the air within a distance of several miles from the project, thus avoiding visibility impacts at the Saguaro

National Monument East Class I area, 18 mi (29 km) north of TEP's South Substation in Sahuarita. Given that the construction would be temporary and the adjacent land is primarily undeveloped, no significant impacts are expected to occur from construction.

No significant air impacts are expected from ongoing operation and maintenance of the Western Corridor. An occasional maintenance vehicle would be required to perform maintenance activities. Where maintenance access roads are not required, restoration of the ROW to natural vegetation would mitigate any fugitive dust emissions. The potential would exist for trace amounts of ozone production resulting from corona effects, the electrical breakdown of air into charged particles around the conductors, as explained in Section 3.10.2, Corona Effects. During damp or rainy weather (the peak conditions for corona effects), the ozone produced from similar transmission lines is less than 1 part per billion (ppb) (DOE 2001a). Background ozone measurements under the direction of the Arizona Department of Environmental Quality (ADEQ) in similar rural areas show 8-hour average ozone levels in the range of 70 to 80 ppb, considerably higher than levels generated by corona effects (Yockey 2001). Thus, no significant effects to air quality would be associated with the operation along the Western Corridor. Corona would be mitigated by using proper line design and by incorporating line hardware shielding.

4.8.1.2 *Central Corridor*

The potential for impacts to air quality associated with the construction and operation of the Central Corridor would be very similar to those for the Western Corridor. An increased number of residents may be temporarily affected by fugitive dust during construction of the Central Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Central Corridor, and it would not be subject to NSR permitting under the CAA. Air quality impacts would be the same for both Options 1 and 2.

4.8.1.3 *Crossover Corridor*

The potential for impacts to air quality associated with the construction and operation of the Crossover Corridor would be very similar to those for the Western Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Crossover Corridor, and it would not be subject to NSR permitting under the CAA.

Air quality impacts would be the same for both options 1 and 2.

4.8.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The potential for impacts to air quality associated with the construction and operation of the Gateway to Valencia 115-kV transmission line corridor would be significantly less than the impacts presented for the Western, Central, and Crossover Corridors. The Gateway to Valencia transmission line corridor would be less than one-tenth the length of the shortest proposed corridor and would require less than one-tenth as much construction. The only NAAQS that could be significantly affected would be PM_{10} , which is assessed in detail in Section 4.8.2.3.

4.8.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Current air quality trends would be expected to continue, as described in Section 3.8, Air Quality.

4.8.2 *Clean Air Act* Conformity Requirements

Section 176(c) of the CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans (in most cases, the State Implementation Plan [SIP]) for achieving and maintaining the National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The State of Arizona General Conformity regulations (R18-2-1438) contain procedures and criteria for determining whether a proposed Federal action would conform to the SIP required by the CAA. (Arizona's General Conformity regulations are identical to, and reference, 40 CFR Part 93, Subpart B.) The regulations apply to a proposed Federal action that would cause emissions of criteria air pollutants above certain levels for the emitted pollutants, in non-attainment or maintenance areas (areas redesignated as attainment within the last 10 years). DOE's guidance document, *CAA General Conformity Requirements and the NEPA Process* (DOE 2000), outlines the specific steps for addressing CAA conformity requirements in *National Environmental Policy Act* (NEPA) documents such as this EIS.

For the proposed Sahuarita-Nogales Transmission Line project, the potential actions of Federal agencies included in this EIS (see Section 1.2.2) are as follows:

- U.S. Department of Energy (DOE) – the granting of a Presidential Permit
- U.S. Department of Agriculture Forest Service (USFS) – issue an authorization to construct, operate, and maintain a 345-kV electrical transmission line and associated support facilities and access roads; and amend the Forest Plan to establish utility corridor, establish utility corridor width, or change visual quality objectives
- Bureau of Land Management (BLM) – the approval of TEP's application to cross Federal lands managed by BLM
- U.S. Section of the International Boundary and Water Commission (USIBWC)- concur on the engineering design and technical studies that support TEP's proposal relative to activities that will occur at and near the international border with the Republic of Mexico

There are two phases to addressing CAA conformity requirements. In the first phase, the conformity *review* process, the Federal agency evaluates whether the conformity regulations would apply to an action (which, in turn, determines if the second phase of analysis is required). The second phase of analysis is the conformity *determination* process, in which the Federal agency demonstrates (often through extensive analyses) how an action would conform to the applicable implementation plan. For the proposed project, DOE, as the lead Federal agency, has conducted a conformity review for each analyzed alternative (the Western, Central, and Crossover Corridors), and has determined that a conformity determination would not be required for implementation of any of these alternatives. To the extent that the final alternative selected differs significantly from the assumptions utilized in the conformity review, the conformity review may need to be revisited before construction of the alternative.

There are two areas for which a conformity review is required, as shown in Figure 3.8–2: (1) the Nogales area, designated as being in moderate non-attainment of the NAAQS for PM_{10}, and (2) a CO maintenance area located near Tucson. The PM_{10} non-attainment area encompasses Township 23 South, Ranges 13 to 14 East, and Township 24 South, Ranges 13 to 14 East, and includes portions of the proposed transmission line, project access, and the Gateway Substation. The CO maintenance area includes Township 16 South, Ranges 12 to 16 East, and runs adjacent to the north of a segment of the proposed transmission line and the South Substation. As stated in Section 4.8.1, both PM_{10} (a component of fugitive dust) and CO would be emitted under each alternative. Thus, PM_{10} and CO are identified as the pollutants of concern for the conformity review.

For the conformity review of each alternative, the total emissions were estimated for each pollutant of concern within the non-attainment or maintenance area for that pollutant. Because the project emissions during operation would be limited to those from occasional maintenance vehicles or equipment, the maximum year of project emissions calculated for the conformity review are those that would occur during a full year of project construction. (Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months). To be conservative in terms of estimating the maximum emissions that could possibly occur, a one-year period for project construction was assumed, with scheduled 6-day work-weeks and with no allowance for work-days lost to bad weather, time off, or holidays. The emissions included within the conformity review are as follows: (1) PM_{10} fugitive dust emission from construction and use of project access (including access road grading), staging areas, and tower and substation areas, (2) PM_{10} and CO vehicle emissions from construction access vehicles and heavy construction equipment, (3) PM_{10} and CO emissions from explosives blasting for tower and access construction, (4) emissions from the personal vehicles of construction workers traveling to and from the project staging sites, and (5) emissions from any increase in recreational use (for example, by off-highway vehicles) of the project area as a result of the proposed project.

In accordance with 40 CFR 93.153 (b), the total emissions estimates of each alternative were compared to the applicable threshold emissions rates for the pollutants of concern, as listed in Table 4.8–1. For both PM_{10} and CO, the applicable threshold emission rate is 100 tons per year (tpy) (91 metric tons, or tonnes, per year [mtpy]). If the total emissions estimates are equal to or greater than the threshold emission rates for any pollutant of concern, a conformity determination would be required.

In addition, according to 40 CFR 93.153 (i) and (j), the total emissions estimates of each alternative are compared to the non-attainment and maintenance area's total emissions (that is, the listing of air pollutant emissions in the U.S. Environmental Protection Agency [EPA]-approved SIP) for the pollutants of concern. If the total emissions estimates are equal to or greater than 10 percent of the emissions inventory for a pollutant of concern, the proposed project would be considered a "regionally significant action" and a conformity determination would be required.

For the Nogales PM_{10} non-attainment area, the SIP that ADEQ submitted to EPA in 1993 did not contain air pollutant emissions estimates, and thus EPA has not taken action to approve this portion of the SIP. Therefore, there is no PM_{10} emissions inventory available for the Nogales PM_{10} non-attainment area (ADEQ 2003a) that would allow a regionally significant level to be formally derived.

For the Tucson CO maintenance area, the EPA-approved SIP includes a Limited Maintenance Plan that does not establish an emissions inventory for CO. The Limited Maintenance Plan was developed with the support of the Pima Association of Governments, that estimated the mobile source emissions of CO (that is, from personal and commercial vehicles), constituting a majority of the CO emissions in the maintenance area. The estimated CO mobile source emissions for the maintenance area for 2003 are 325.1 tons per day, or 118,661 tpy (107,647 mtpy) (EPA 2000a). Therefore, 10 percent of 118,661 tpy (107,647 mtpy), that is, 11,866 tpy (10,765 mtpy), may be regarded as the emissions level above which the proposed project may be considered a regionally significant action. This regionally significant level for the Tucson maintenance area CO emissions is listed in Table 4.8–2.

Table 4.8–1. Regulatory Threshold Emission Rates for PM_{10} and CO

Criteria Pollutant and Air Quality Classification	Threshold Emission Rates (tons per year)
PM_{10} Moderate Non-attainment Area	100
CO Maintenance Area	100

Source: 40 CFR 93.153[b].

Table 4.8–2. Regionally Significant Action Level of PM_{10} and CO

Criteria Pollutant	Emission Rates (tons per year)
PM_{10}	(no EPA-approved SIP)
CO	11,866

EPA = U.S. Environmental Protection Agency; SIP = State Implementation Plan
Source: EPA 2000a, EPA 2003b

The following background assumptions were made for estimating the fugitive dust emissions, equipment and vehicle emissions, and explosives blasting emissions for the Western, Central, and Crossover Corridors. Where precise information is not known conservative assumptions (potential overestimates) are used.

- There would be an estimated 18.8 mi (30.3 km) of unpaved project access roads for the Western Corridor, and 11.6 mi (18.7 km) for the Central and Crossover Corridors, within the Nogales non-attainment area. Access roads would be 12 ft (3.6 m) wide.

- There would be 57 support structures in the Western Corridor within the Nogales PM_{10} non-attainment area, and 65 support structures in the Central and Crossover Corridors within the Nogales PM_{10} non-attainment area.

- Each structure site would require a 100 by 200 ft (30 by 60 m) assembly area, which in some cases would overlap with the tower construction areas described in the following bullet item.

- Ten percent of the structures would be lattice towers (requiring 80,000 ft^2 [7,400 m^2] per tower for construction), and the remaining 90 percent would be monopoles (requiring 31,415 ft^2 [2,920 m^2] per tower for construction). Given the overlap of these tower construction areas with some of the tower assembly areas (in the previous bullet item), the net tower construction areas are reduced by 25 percent each for use in the emissions calculations.

- There would be a total of two tensioning/pulling sites (each 150 by 250 ft [46 by 76 m]) under active construction or use at any one time within the Nogales non-attainment area for any of the three proposed corridors.

- Construction along the Western, or Central, or Crossover Corridors would last one full year and would proceed at a steady rate along the entire length of the transmission line that is selected. There would be two construction crews within the Nogales PM_{10} non-attainment area, and one construction crew within the Tucson CO maintenance area, that would be working a maximum of 6 days a week throughout a year, or 313 days per year. Down time from bad weather, holidays or time off is conservatively assumed to be zero. Thirteen percent of the segment of the Western Corridor within the Nogales PM_{10} non-attainment area would be under construction at any one time, and 17 percent of that segment of the Central and Crossover Corridors that lies within the Nogales PM_{10} non-attainment area would be under construction at any one time.

- Construction at the Gateway Substation would last for 7 months of 6 day work-weeks.

- Of the 18 acres (7.3 ha) of the TEP portion of the Gateway Substation,10 acres (4 ha) would be fenced for construction, and 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time during the 7 month construction period.

- An additional 3 acres (1.2 ha) at the staging area adjacent to the Gateway Substation would be engaged in construction activities for 3 months of 6 day work-weeks.

- Each construction crew would utilize the following equipment continuously for 8 hours each day: one planer or bulldozer, one scraper, one wheeled loader, one off-highway truck, one loader, one excavator, one concrete paver, one crane, and one water spray truck (see Figure 2.2–1 for representative photographs of the proposed construction equipment).

- All emissions estimates and assumptions, unless otherwise stated, are based on EPA's Compilation of Air Pollutant Emission Factors (AP-42, EPA 1995). To calculate the fugitive dust emissions rate, the daily emissions rate of 80 pounds of total suspended particulate matter (TSP) per acre of active construction per day (90 kg per ha per day) was multiplied by the percentage of PM_{10} in TSP, which varies with soil type (Wild 1993). The proposed project would cross a range of soil types, as shown in Figure 3.6–5, from sandy loams (10 to 30 percent PM_{10}) to clay loams (30 to 50 percent PM_{10}). The highest possible percentage of PM_{10} was conservatively assumed to be the 50 percent maximum.

- TEP would employ dust control measures on unpaved roads and in work areas. A control efficiency of 50 percent was assumed for typical dust control measures, such as watering roads and work areas, in an arid climate. This conservative estimate is based on EPA dust control efficiency assumptions for similar climates, ranging from 54 to 75 percent dust control (EPA 2002).

- In addition to the construction crews, there would be two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction.

- The 80-acre (32-ha) construction lay down yard would be near the Arivaca Road and I-19 interchange, approximately 20 mi (32 km) outside of both the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area.

The emissions estimates for the pollutants of concern, and the results of the comparisons of the emissions to the threshold emissions rates and the area's emissions inventory, are presented in the following sections.

4.8.2.1 *Western Corridor*

The length of the Western Corridor within the Nogales PM_{10} moderate non-attainment area would be approximately 8.3 mi (13.4 km) and would include an estimated 57 support structures. Also within the Nogales PM_{10} moderate non-attainment area would be the Gateway Substation. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction; of these 10 fenced acres a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months. The South Substation and approximately 1 mi (1.6 km) of the project corridor common to all three alternatives are just inside the Tucson CO maintenance area.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Western Corridor within the PM_{10} non-attainment area would be approximately 12 acres (5 ha). This area would include support structure construction and access roads. This would result in maximum PM_{10} emissions of approximately 37.1 tpy (33.6 mtpy). Maximum PM_{10} emissions from 5 acres (2 ha) within the 10-acre (4-ha) fenced area of the Gateway Substation under continuous construction for seven months are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy

(2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge would be limited to fracturing rock in a small area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle kilometer) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy (2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Helicopters would be used to install conductors on the support structures once in place. Approximately 8.3 mi (13.4 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Thus, the total PM_{10} emissions would be approximately 62 tpy (56 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

For the CO maintenance area, the direct emissions sources included in the calculations are from equipment and vehicle emissions and explosives blasting. Assuming that one construction crew is active all year within or adjacent to the CO maintenance area, and based on AP-42 construction vehicle emission

factors and the equipment and usage factors given in the assumptions, the CO emissions would be an estimated 11.5 tpy (10.4 mtpy).

CO is the pollutant produced in the greatest quantities from explosives detonation. For ammonium nitrate and fuel oil, the explosives commonly used for construction work, approximately 67 pounds of CO would be emitted for each ton of rock blasted (EPA 1995). Assuming that TEP performs 25 blasts of 10 tons (9.1 metric tons) of rock each, in the area within or adjacent to the CO maintenance area, the resulting CO emissions would be an estimated 8.4 tpy (7.6 mtpy).

Emissions from construction workers' personal vehicles reporting to one of the three project staging sites could also contribute CO to the Tucson maintenance area depending on where the workers live. Assuming that the construction workers reporting to the South Substation staging area would drive 15 mi (24 km) each way in the Tucson CO maintenance area, and given EPA's factor of 0.046 lbs CO per mi (0.013 kg per km), maximum annual emissions of CO would be an estimated 4.3 tpy (3.9 mtpy) (EPA 2000b). Thus, the maximum year of emissions could result in an estimated 24.2 tpy (21.9 mtpy) of CO emissions immediately adjacent to or within the Tucson CO maintenance area. This emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy) that would trigger a conformity determination. This emissions rate would also be below the regionally significant source emissions threshold rate of 11,866 tpy. Therefore, a conformity determination for the proposed project within the Tucson CO maintenance area would not be required.

4.8.2.2 *Central and Crossover Corridors*

The Central and Crossover Corridors are identical within the Nogales PM_{10} non-attainment area, and are addressed by a single conformity review that follows for the PM_{10} non-attainment area. The Central and Crossover Corridors are the same as the Western Corridor with respect to the Tucson CO maintenance area; therefore, the assumptions, emissions estimates, and conclusion described in Section 4.8.2.1 that a conformity determination would not be required for the proposed project adjacent to the CO maintenance area also apply for the Central and Crossover Corridors. Additionally, Options 1 and 2 for either the Central or Crossover Corridor would have similar air emissions and therefore are not analyzed separately.

The Central and Crossover Corridors within the Nogales PM_{10} moderate non-attainment area would be approximately 10.5 mi (16.9 km) long and would include 65 support structures. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction, and, of these 10 fenced acres, a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Central Crossover Corridor within the PM_{10} non-attainment area would be approximately 15 acres (6 ha). This area would include support structure construction and access roads. This would result in maximum emissions of approximately 47.6 tpy (43.2 mtpy). Maximum PM_{10} emissions from five acres under continuous construction for seven months within the 10-acre (4-ha) fenced area of the Gateway Substation are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy (2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently

used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge is limited to fracturing rocks in a localized area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

An estimated 20 to 25 structures would be brought in by helicopter for the Peck Canyon portion of the Crossover Corridor because of its topography and inaccessibility. Helicopters would be used to install conductors on the support structures once in place. Approximately 10.5 mi (16.9 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast Air Quality Management District 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle km) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy 2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Thus, the total PM_{10} emissions would be approximately 73 tpy (66 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

4.8.2.3 *115-kV Interconnection of the Gateway and Valencia Substations*

The length of the Gateway to Valencia 115-kV Transmission Line within the Nogales PM_{10} moderate non-attainment area would be approximately 3.0 miles (4.8 km) and would include an estimated 20 support structures. Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line within the PM_{10} non-attainment area would be approximately 4.3 acres (1.7 ha). This area would include support structure construction and access roads. This would result in maximum PM_{10} emissions of approximately 13.3 tpy (12.0 mtpy). The maximum

PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 1.4 tpy (1.3 mtpy) within the Nogales PM_{10} non-attainment area.

Helicopters would be used to install conductors on the support structures once in place. Approximately 3.0 miles (4.8 km) of transmission line would be installed using helicopters within the Nogales PM_{10} non-attainment area. This work would be accomplished in one day (assume 10 hours). The helicopter movement generally would cause some dust to be generated by downwash from the rotor blades. Such dust generation is similar to that from wind erosion and would be expected to cause entrainment of the loose surface material. The amount of dust generated would be small and would impact only the localized areas. For the helicopter operations within the Nogales PM_{10} non-attainment area, an emission factor of 21.3 lb (9.7 kg) of fugitive PM_{10} per hour may be assumed (South Coast Air Quality Management District 1993). Thus, maximum fugitive dust emissions from helicopter operations would be 213 lb (97 kg) or 0.11 tons (0.10 t).

Thus, the total PM_{10} emissions would be approximately 14.8 tpy (13.4 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

4.8.3 PM_{10} Contributions from Transmission Line Construction in Mexico

Emissions that could be generated in Mexico from the construction of Mexico's connecting portion of the transmission line were assumed to occur simultaneously with TEP's construction of the proposed project in the U.S., as a scenario to predict maximum annual emissions. Given the lack of available information on project design and construction in Mexico (as TEP would not construct this portion of the project), the conservative assumptions stated previously for project access, support structure type and span length, and construction progression and equipment in the U.S. were also applied for construction on the Mexico portion of the project. Project-generated emissions for Mexico could be transported to the U.S. by tropospheric dispersion. As shown in Figure 3.8–1, surface winds are predominately southeasterly, and blow from Mexico in the south to the U.S. in the north (including to the north, north-northeast, and north-northwest) approximately 25 percent of the time (NOAA 2003). Emissions from the project connecting to TEP's proposed border crossing into Nogales, Mexico, were considered for the first 10 mi (16 km) of Mexico's project south of the border, mirroring the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area. As estimated for the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area, approximately 15 acres (6 ha) in Mexico near the U.S. border may be under active construction at any one time and approximately 61 tpy (56 mtpy) of PM_{10} emissions may result. If 25 percent of these emissions were transported to the Nogales, Arizona, PM_{10} non-attainment area in the U.S., this would correspond to a contribution of approximately 15 tpy (14 mtpy) of PM_{10} emissions from Mexico.

4.9 NOISE

This section discusses the potential noise impacts of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project along each alternative corridor. The methodology for determining impacts is presented below, followed by a description of the impacts from each alternative.

Methodology

The noise impact analysis evaluates the potential noise levels generated during construction and operation of the proposed project, and identifies potential receptors along each alternative corridor. The analysis includes quantification of projected noise levels and assesses the potential for corona effects from transmission lines. Specific noise impacts would be mitigated by limiting the daily hours of construction of the proposed project.

As explained in Section 3.9, noise levels are measured as a composite decibel (dB) value. The adjusted decibels (dBA) represent the human hearing response to sound for a single sound event. Day-Night Average Sound Level (DNL) represents the average sound level over a complete 24-hour period, which is often used for the evaluation of community noise effects.

For construction of the proposed project, both an average noise level (DNL) and a single sound event noise level (dBA) have been evaluated. The single sound event analysis shows the peak noise levels near the right-of-way (ROW), while the DNL predicts average community noise levels near the ROW. For this analysis, the calculation of the DNL assumes that no construction would occur between the hours of 10 p.m. and 7 a.m. The noise levels are calculated for the nearest residences and businesses to the ROW. Noise levels would be reduced for receptors further removed from the ROW by approximately 6 dBA for each doubling of distance from the source. For example, a 75 dBA noise heard at 50 ft (15 m) from the source would be reduced to 69 dBA at 100 ft (30 m) away from the source (Canter 1977).

The potential for construction noise to impact wildlife is addressed in the Biological Assessments prepared for the proposed project, included as Appendices D, E, and F of this Environmental Impact Statement (EIS) (HEG 2003a, 2003b, 2003c). The species that may be affected are described in this section and in Section 4.3, Biological Resources.

In determining the significance of the calculated DNL, results for each alternative are compared to established standards. In 1974, the U.S. Environmental Protection Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgements of sound presented within a short timespan indicate that a change of ±5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be "barely perceptible." Changes in sound levels of ±10 dBA within a short timespan may be perceived by humans as "dramatic" and changes in sound levels of ±20 dBA within a short timespan may be perceived as "striking." In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001a).

The construction schedule of each alternative would likely involve several areas under active construction concurrently. As construction of the project progresses, the areas impacted by noise would follow the active construction areas. Construction for the proposed project would be completed in a period of 12 to 18 months.

4.9.1 Western Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Western Corridor. Construction activities would generate noise produced by heavy construction equipment and trucks used along the access roads and ROW. Explosives blasting may be used as needed, based on local geologic conditions, and thus could contribute to noise impacts. Construction noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction.

Table 4.9–1. Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment[a].

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1,000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

[a] Attenuation with distance is dependent on the frequency of the sound and thus varies as shown for the following sources of varying frequencies.
Source: Golden et al. 1980.

The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 3.9). Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

Table 4.9–2. Example of Maximum Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper

	Distance from Source				
	50 ft	**100 ft**	**200 ft**	**1,000 ft**	**2,500 ft**
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	77 dBA	69 dBA

For tower sites where workers or equipment are to be inserted by helicopter or sky crane, the approach, landing, and takeoff of a helicopter would be an additional noise source. Noise from medium-lift helicopters typical of those that would be used is in the range of 90 to 100 dBA at 100 ft (31 m). Helicopters are most likely to be used within the Coronado National Forest, where fewer access roads currently exist.

Explosives blasting may be required at tower locations founded on bedrock in steep terrain, in order to level the base prior to rock bolting the tower. The projected peak noise levels associated with explosives blasting would be in the range of the construction equipment listed in Table 4.9–1 (Golden et al. 1980). As blasting is accomplished most efficiently by directing the blasting energy into the ground, the noise associated with blasting would be mitigated by the noise absorbing effects of the ground.

The potential construction noise impacts of the Western Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW, as described in Land Use, Section 3.1. The existing background noise in residential and commercial areas is typically 45 dBA or higher. Table 4.9–2 shows that peak construction noise at a distance of approximately 1,000 ft (305 m) from the ROW would be an estimated 77 dBA. The residences nearest to the ROW (an estimated 1,000 ft [305 m] away), as described in Section 3.1, would experience construction noise levels that may be perceived as striking or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized and intermittent. The average total duration that any construction area may be active is 2 to 3 months. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation within the Coronado National Forest, as described in Section 3.1.2.

Impacts to sensitive species that are discussed in Section 4.3 result from noise disturbance associated with construction activities. See Section 4.3, Biological Resources for a discussion of noise impacts to sensitive species.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW.

In evaluating the potential for hearing damage (both Temporary Threshold Shift and Noise-Induced Permanent Threshold Shift), the noise level and duration of exposure are considered. For example, Noise-induced Permanent Threshold Shift would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, Temporary Threshold Shift would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage.

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or

hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles.

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. During dry weather conditions, audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Modern transmission lines are designed, constructed, and maintained so that during dry conditions they will operate below the corona-inception voltage, meaning that the line will generate a minimum of corona-related noise. Sound level measurements taken during fair weather at existing TEP 345-kV transmission lines indicate only a 2 to 3 dB difference between background noise levels and levels beneath the transmission lines (Meyer 2001b). In foul weather conditions corona discharges can be produced by water droplets and fog. Given the arid climate in the project area and the distance of receptors from the ROW, the impact of corona-generated audible noise is not expected to be significant.

Transformers at the existing South Substation in Sahuarita and the new Gateway Substation in Nogales would generate minimal noise during operation. There are no residences within 0.5 mi (0.8 km) of either substation and the substation noise would not be discernible from background noise at any residences. Measurements at an existing TEP substation similar to those proposed indicate sound levels to be typically 40 to 55 dBA, within the existing background range (Meyer 2001b). Occasional maintenance activities on the transmission lines and substations would be required. Noise impacts from these activities would be intermittent and are not expected to be significant.

Based upon the noise impacts analyses of the Western Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

4.9.2 Central Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Central Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. As there is increased development along the I-19 corridor compared to the Western Corridor, as described in Section 3.1, Land Use, a few more residences may experience temporary construction noise impacts. Noise impacts would be the same for both options 1 and 2.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Central Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 500 ft [150 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as “striking” or very loud. Peak noise levels experienced by Tubac residents would be comparable to a street sweeper at a distance of 30 ft (9 m). These peak noise levels would be localized, temporary, and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the limited segment of the Central Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor in Section 4.9.1, the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Central Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.3 Crossover Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Crossover Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely. Noise impacts would be the same for both options 1 and 2.

The potential construction noise impacts of the Crossover Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (the same as described for the Western Corridor) would experience construction noise levels that may be perceived as "striking" or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized, temporary and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the Crossover Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor in Section 4.9.1, the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise

would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Crossover Corridor, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.4 115-kV Interconnection of the Gateway and Valencia Substations

Construction Impacts. The acoustical environment would be impacted during construction of the 115-kV Gateway to Valencia Substations interconnection to the Western Corridor as described in Section 4.9.1, but would be shorter in duration.

The potential construction noise impacts of the 115-kV Gateway to Valencia Substations Interconnection would primarily affect the residences, commercial and industrial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 200 ft [61 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as "striking" or very loud .

Operational Impact. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.5 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. Potential noise impacts associated with the construction and operation of the Sahuarita-Nogales Transmission Line Project would not occur. The local noise conditions would continue according to current patterns, as described in Section 3.9.

4.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses the potential human health and environment effects of the proposed project. The methodology for determining effects is presented, followed by a description of the effects for each alternative. Potential impacts on human hearing are addressed in Section 4.9, Noise Impacts.

Methodology

The electric and magnetic field (EMF) effects of the transmission lines were calculated for a range of distances from the transmission line. In general, the farther removed a person is from the transmission line, the lower the EMF strength. A number of different scenarios were tested in the calculations. Because the magnetic field varies with the current carried on the transmission line, magnetic field strength was calculated for both the normal anticipated current load of 250 million volt-amperes (MVA) per circuit, and the maximum anticipated current load of 500 MVA per circuit. Calculations were also performed for a number of different transmission line configurations (vertical optimized phasing orientation or vertical non-optimized phasing orientation) that can affect the EMF strength. In the optimized phasing orientation, the phases of the two circuits are offset to minimize the EMF strength. As described in Section 3.10, the focus of EMF health studies and the focus of the following impacts analysis is on magnetic fields, although electric fields are included for completeness.

Since Tucson Electric Power Company's (TEP) policy is to minimize EMF exposure levels to the extent practicable, TEP would use the vertical optimized phasing orientation for the double-circuit line. Results from the non-optimized phasing orientation are included for comparison purposes only. The calculations evaluate EMF strength at a range of distances from the centerline of the transmission line, both within and outside the approximate 125-ft (38-m) right-of-way (ROW). The magnetic field is expressed in units of milligauss (mG); the electric field is expressed in units of kilovolt per meter (kV/m).

The potential for corona effects and effects on safety is also evaluated. The nearest potential receptors to the transmission line based on the proposed corridors are listed for each alternative, including residences, schools, and commercial establishments.

4.10.1 Electric and Magnetic Fields

4.10.1.1 *Western Corridor*

Electric and Magnetic Field Effects. The Western Corridor would consist primarily of single steel pole double-circuit structures strung with 345-kV conductors. The spacing of the structures would be in the range of 600 to 1,000 ft (183 to 305 m) apart. The minimum ground clearance of the conductors would be 32 ft (9.8 m).

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission line. Table 4.10–2 lists this same information for maximum anticipated load conditions. EMF strength is given for both the optimized phasing configuration that would be used by TEP, and for the non-optimized phasing configuration for comparison purposes. Figures 4.10–1 and 4.10–2 graphically illustrate the EMF strengths, respectively, for the optimized phasing configuration of the transmission line (Meyer 2001a). The distances given represent the distance of a receptor from the centerline of the transmission line. At a given distance, the electric and magnetic field strength would be nearly identical on both sides of the transmission line.

Table 4.10–1. EMF Strength for Normal Operating Conditions (250 MVA Current, 345-kV Double Circuit)

	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
Distance from Centerline (feet)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)
1500	0.002	0.001	0.102	0.004
1250	0.004	0.001	0.146	0.006
1000	0.007	0.002	0.228	0.009
750	0.017	0.003	0.405	0.015
500	0.056	0.007	0.904	0.034
450	0.076	0.009	1.112	0.041
400	0.108	0.012	1.401	0.051
350	0.159	0.016	1.817	0.065
300	0.248	0.021	2.448	0.084
250	0.418	0.030	3.467	0.113
200	0.777	0.042	5.257	0.153
175	1.114	0.048	6.698	0.175
150	1.667	0.050	8.785	0.192
125	2.627	0.032	11.934	0.183
100	4.403	0.054	16.897	0.084
90	5.520	0.129	19.667	0.054
80	6.999	0.252	23.055	0.214
70[a]	8.973	0.448	27.198	0.497
60	11.612	0.753	32.223	0.946
50	15.108	1.203	38.171	1.630
45	17.228	1.486	41.440	2.078
40	19.598	1.799	44.821	2.601
35	22.190	2.122	48.196	3.186
30	24.936	2.418	51.400	3.812
25	27.713	2.638	54.233	4.438
20	30.351	2.729	56.508	5.014
15	32.653	2.659	58.117	5.492
10	34.433	2.450	59.081	5.838
5	35.552	2.206	59.544	6.042
0	35.934	2.093	59.673	6.108

[a] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

Table 4.10–2. EMF Strength for Maximum Operating Conditions (500 MVA Current, 345-kV Double Circuit)

Distance from Centerline (feet)	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
	Magnetic Field Strength (mG)	Electric Field [a] Strength (kV/m)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)
1500	0.004	0.001	0.203	0.004
1250	0.007	0.001	0.293	0.006
1000	0.014	0.002	0.457	0.009
750	0.034	0.003	0.810	0.015
500	0.112	0.007	1.807	0.034
450	0.153	0.009	2.224	0.041
400	0.216	0.012	2.801	0.051
350	0.318	0.016	3.364	0.065
300	0.497	0.021	4.897	0.084
250	0.835	0.030	6.934	0.113
200	1.553	0.042	10.514	0.153
175	2.227	0.048	13.396	0.175
150	3.334	0.050	17.570	0.192
125	5.254	0.032	23.868	0.183
100	8.807	0.054	33.795	0.084
90	11.040	0.129	39.334	0.054
80	13.998	0.252	46.109	0.214
70[b]	17.945	0.448	54.395	0.497
60	23.223	0.753	64.446	0.946
50	30.217	1.203	76.343	1.630
45	34.455	1.486	82.881	2.078
40	39.196	1.799	89.643	2.601
35	44.381	2.122	96.393	3.186
30	49.871	2.418	102.800	3.812
25	55.425	2.638	108.466	4.438
20	60.702	2.729	113.017	5.014
15	65.306	2.659	116.234	5.492
10	68.866	2.450	118.163	5.838
5	71.105	2.206	119.088	6.042
0	71.867	2.093	119.346	6.108

[a] Electric field strength is not affected by the current load. Thus, electric field strength values given for normal and maximum operating conditions are the same.
[b] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

Beyond the edge of a 125-ft (38-m) ROW, the magnetic field strength of the optimized phasing configuration under normal operating conditions would be 8.9 mG. This would diminish to 4.4 mG at a distance of 100 ft (30 m) from the centerline, 0.78 mG at a distance of 200 ft (61 m) from the centerline, and 0.25 mG at a distance of 300 ft (91 m) from the centerline. For comparison purposes only, the non-optimized phasing configuration would result in a magnetic field of 27 mG at the edge of a 125-ft (38-m) ROW, three times the magnetic field from the optimized phasing configuration. Temporary exposure to magnetic fields on this level of magnitude are similar to being 1 ft (0.3 m) away from common household appliances such as a mixer or hair dryer (Waveguide 2003).

The electric field strength at the edge of a 125-ft (38-m) ROW under normal operating conditions for the optimized phasing configuration would be 0.45 kV/m. This would diminish to 0.054 kV/m at a distance of 100 ft (30 m) from the centerline, 0.042 kV/m at a distance of 200 ft (61 m) from the centerline, and 0.021 kV/m at a distance of 300 ft (91 m) from the centerline.

Tables 4.10–1 and 4.10–2 demonstrate the EMF strength reductions that would be achieved by TEP's use of the optimized phasing configuration, compared to the non-optimized phasing configuration. Two shield wires, which provide necessary shielding for lightning protection, would be placed near the top of each pole to shield the 12 345-kV phase subconductors. Each circuit of a double-circuit transmission line consists of three phases; each phase consists of two subconductors. Phasing between the two circuits would be configured in a way that would minimize EMF strength.

Magnetic field levels would be elevated in the vicinity of the proposed ROW on Bureau of Land Management (BLM) land and in other areas where TEP's proposed project would be adjacent to existing transmission lines, west of Sahuarita and Green Valley as shown in Figure 3.11–1. As an example of maximum combined EMF from existing transmission lines and the proposed project, TEP has modeled EMF levels from the proposed project on BLM land, where the proposed project runs adjacent to the south of 345-kV and 138-kV transmission lines. At the southern edge of the ROW of TEP's proposed transmission line (340 ft [104 m] south of the existing 345-kV transmission line), the magnetic field would be 12.1 mG and the electric field would be 0.83 kV/m. At a distance of 200 ft (61 m) south of the proposed centerline, the magnetic field would be 0.9 mG and the electric field would be 0.045 kV/m. This would diminish to a magnetic field of 0.44 mG and an electric field of 0.024 kV/m at a distance of 300 ft (91 m) from the centerline (TEP 2003).

It is the policy of TEP that no residences would be within the ROW. The nearest residences to the proposed Western Corridor ROW are a group of about five houses at a distance of approximately 1,000 ft (305 m) from the ROW centerline, south of Sahuarita Road, west of the Town of Sahuarita. Sahuarita High School and Middle School are approximately 4,000 ft (1,200 m) south of the ROW centerline.

In the segment from Gateway Substation to the U.S.-Mexico border, there are warehouses and apartments approximately 1,000 ft (305 m), from the corridor centerline. Mary Welty Elementary School is located more than 1 mi (1.6 km) to the east of the ROW near the U.S.-Mexico border.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

Safety. As described in Section 3.10.1, the electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses. The following describes the potential for effects on safety, and design mitigation measures that would be incorporated.

Induced Currents. The 345-kV transmission lines would have a minimum ground clearance of 32 ft (9.8 m) to reduce the potential for induced current shocks. In addition, permanent structures in the ROW, such as fences, gates, and metal buildings would be grounded.

Steady-State Current Shocks. Features reducing the level of potential for induced current in objects near the transmission line also reduce the level of a possible induced current shock. The proposed lines would be constructed in accordance with industry and TEP standards to minimize hazardous shocks from direct or indirect human contact with an overhead, energized line. These lines are not expected to pose any such hazards to humans.

Spark Discharge Shocks. In accordance with TEP's transmission line standards, the magnitude of the electric field would be low enough that spark discharge shocks would occur rarely, if at all. The potential for nuisance shocks would be minimized through standard grounding procedures. Carrying or handling conducting objects, such as irrigation pipe, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if the section of pipe is inadvertently tipped up near the conductors. The transmission lines would be constructed with adequate ground clearance to minimize these effects.

Field Perception and Neurobehavioral Responses. Perception of the field associated with the transmission lines would not be felt beyond the edge of the ROW. Persons working under the ROW might feel the field. Studies of short-term exposure to electric fields have shown that fields may be perceived (for example, felt as movement of arm hair) by some people at levels of about 2 to 10 kV/m, but studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks (DOE 2001a). The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that short-term exposures be limited to 4.2 kV/m for the general public. The exposures associated with the proposed action are below this recommended limit, reaching a maximum of less than 2.8 kV/m within the ROW (ICNIRP 2003).

The single pole steel structures that would be used are non-climbable. The ground clearance of the conductors would be a minimum of 32 ft (9.8 m), adequate clearance for safety considerations as related to most recreational activities.

The Amended Certificate of Environmental Compatibility issued to TEP on January 15, 2002, by the ACC (ACC 2001) includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing 50 ft (15 m) El Paso Natural Gas Company (EPNG) pipeline ROW. TEP would comply with this provision.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, firefighters would monitor smoke near the transmission line for possible fire starts outside of the fire perimeter. Firefighters would remain at a distance that would not leave them vulnerable to the electric current or shock.

Power Line Hazards are identified in the Forest Service Fireline Handbook (NWCG Handbook 3, PMS 410-1, NFES 0065). If possible, the power company should deactivate lines in the fire area that may endanger firefighters. All personnel should be cautioned against directing water streams or aerial retardant into high-tension lines. They should also be made aware that the smoke may become charged and conduct the electrical current. Deactivated transmission and distribution lines may continue to pose a hazard due to induction. TEP and any involved firefighting personnel would follow the mitigation and safety requirements on pages 53 and 54 of the Fireline Handbook, and additional mitigation and safety requirements in Forest Service Handbook (FSH) 6709.11 (Health and Safety Code Handbook) on pages 30-29 and 30-30.

4.10.1.2 *Central Corridor*

The Central Corridor would involve the construction of 345-kV double-circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Central Corridor. However, the list of nearest receptors to the transmission lines would be different for the Central Corridor. Options 1 and 2 would have the same impacts.

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission lines. Table 4.10–2 lists this same information for maximum anticipated load conditions. Figures 4.10–1 and 4.10–2 graphically illustrate the electric and magnetic field strengths, respectively, for the optimized phasing configuration of the transmission lines. The distances given represent the distance of a receptor from the centerline of the transmission lines. At a given distance, the EMF strength would be nearly identical on both sides of the transmission line ROW.

The nearest receptors to the proposed Central Corridor ROW include all of those listed for the Western Corridor, with the following additions. In the Tubac area there are multiple residences between 1,200 and 1,800 ft (370 to 550 m) from the centerline of the ROW. The nearest residences to the Central Corridor are three houses approximately 500 ft (150 m) from the centerline, north of Aliso Springs Road in Tubac. The Sopori School is located approximately 1 mi (1.6 km) east of the ROW in the town of Amado. The Cascabel School is approximately 2.2 miles (3.5 km) to the east of the ROW.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

The potential for effects on safety and design mitigation measures for the Central Corridor are the same as those listed for the Western Corridor.

4.10.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of 345-kV double circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Crossover Corridor. The nearest potential receptors and the maximum long-term EMF exposure from the transmission lines would be the same as for the Western Corridor. Options 1 and 2 would have the same impacts.

The potential for effects on safety and design mitigation measures for the Crossover Corridor are the same as those listed for the Western Corridor.

4.10.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The EMF strength for the 115-kV transmission line would be bounded by the analysis for the 345-kV transmission lines discussed above.

4.10.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no EMF exposure associated with the project. EMF exposure from existing transmission lines and household appliances would be expected to continue according to current trends.

4.10.2 Corona Effects

4.10.2.1 *Western Corridor*

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. As described in Section 3.10.2, corona is of concern for potential radio and television interference, audible noise, and photochemical reactions.

Audible Noise. Noise levels generated by the transmission lines would be greatest during damp or rainy weather. For the proposed lines, low-corona design established through industry research and experience would minimize the potential for corona-related audible noise. The proposed lines would not add substantially to existing background noise levels in the area. Research by the Electric Power Research Institute (EPRI) (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a 100 ft (30 m) ROW. During rainy or damp weather, an increase in corona-generated audible noise would be balanced by an increase in weather-generated noise. For a complete assessment of the noise from the Proposed Action and alternatives, refer to the analysis of noise in Section 4.9.

Radio and Television Interference. Transmission line-related radio-frequency interference is one of the indirect effects of line operation produced by the physical interactions of transmission line electric fields. The level of such interference usually depends on the magnitude of the electric fields involved. The line would be constructed according to industry standards, which minimize the potential for surface irregularities (such as nicks and scrapes on the conductor surface), sharp edges on suspension hardware and other irregularities around the conductor surface that would increase corona effects. However, if such corona interference were to be generated, no interference-related complaints would be expected given the distance of residents from the transmission lines. Federal Communications Commission regulations require each project owner to ensure mitigation of any such interference to the satisfaction of the affected individual.

Visible Light. The corona levels associated with the proposed transmission lines would be similar to those of existing transmission lines. The visible corona on the conductors would be observable only under the darkest conditions with the aid of binoculars. There would be no effects on the operation of observatories in the project vicinity (Fred Lawrence Whipple and Kitt Peak Observatories) from the proposed project (Criswell 2002).

Photochemical Reactions. The maximum incremental ozone levels at ground level produced by corona activity on the proposed transmission lines would be similar to that produced by the existing lines in the area. During damp or rainy weather the ozone produced would be less than 1 ppb. This level is insignificant when compared to natural levels and their fluctuations (DOE 2001a).

Corona would be mitigated by using proper line design and by incorporating line hardware shielding. The design of electrical hardware and equipment considers the potential for corona effects.

4.10.2.2 *Central Corridor*

The corona effects generated under the Central Corridor would be the same as those described for the Western Corridor.

4.10.2.3 *Crossover Corridor*

The corona effects generated under the Crossover Corridor would be the same as those described for the Western Corridor.

4.10.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Little or no corona activity is expected for the proposed 115-kV transmission line interconnection.

Audible Noise

For 115-kV lines, this noise is noticeable during fair weather. During rainy or very moist conditions, drops of water can form on the conductors, resulting in increased corona activity when a crackling or humming sound could be heard near the lines. The noise decreases with distance from the line.

Due to the low audible noise level, the relatively few hours of weather producing audible noise and location of the line with respect to neighboring land uses, no impacts are anticipated for the 115-kV transmission line interconnection.

Radio and Television Interference

Corona may affect AM radio reception adjacent to the line. However, radio interference from corona is not expected to be a problem since little or no corona activity is expected from the 115-kV line.

A much more likely source of radio and television interference arises through electrical equipment in the home itself. The line voltage and the distance of prospective line routes from residences minimize the likelihood of objectionable audible noise, radio interference, or television interference from the line. Should it occur, TEP or Citizens would record and investigate complaints of radio and television interference and take corrective action when necessary.

4.10.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no corona effects associated with the project.

4.10.3 Safety of Co-locating a Transmission Line and a Pipeline

4.10.3.1 *Western, Central and Crossover Corridor*

There are a number of potential safety issues associated with constructing a transmission line near a buried natural gas pipeline, related to electrical shock hazard and natural gas pipeline leaks and fire or explosion hazards should a natural gas leak occur.

A buried pipeline that shares a corridor with an alternating current (AC) transmission line, such as the one proposed for the project, could become energized by the EMF surrounding the power system in the air and soil. This AC interference may result in an electrical shock hazard for people touching the pipeline or metallic structures connected to the pipeline, and may cause damage to the pipeline coating, insulating flanges, or even damage to the pipeline's wall itself (Dawalibi 2004). However, the natural gas pipeline would not carry electricity or otherwise present a shock hazard to residential gas users.

A minimum distance of 100 ft (30 m) would be maintained between any of the proposed transmission line structures and the edge of the existing EPNG pipeline ROW, in compliance with the Amended Certificate of Environmental Compatibility issued to TEP on October 29, 2001, by the ACC. Additional mitigation measures may include applying protective coating to the gas pipeline and installing cathodic protection system to the gas pipeline to minimize shock hazard and damage to the pipeline. TEP has consulted with EPNG about the proposed project and once an exact location for the structures is determined, TEP will have detailed discussions with EPNG regarding pipeline damage and shock hazard protection for the gas pipeline. In addition, the transmission line would comply with all Federal and state regulations concerning co-locating transmission line near a buried gas pipeline (Dawalibi 2004).

There are potential safety issues associated with construction and maintenance vehicles driving over the gas pipeline. TEP would consult with El Paso after final siting of the transmission line structures regarding this issue.

4.10.3.2 *115-kV Interconnection of the Gateway and Valencia Substations*

This transmission corridor would not be co-located with a natural gas pipeline and thus, no potential safety issues would result.

4.10.3.3 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS and there would be no associated safety issues regarding co-location with a natural gas pipeline.

4.11 INFRASTRUCTURE

This section discusses the impacts of the project to the local infrastructure including the current utilities and facilities in the area of the proposed project. This section also discusses waste management issues. Roads are discussed in Section 4.12, Transportation.

4.11.1 Utilities and Facilities

4.11.1.1 *Western Corridor*

Construction of the proposed project in the Western Corridor would result in the following changes to the existing infrastructure:

- Tucson Electric Power Company's (TEP) existing South Substation would be expanded to accommodate the 345-kV line to the new Gateway Substation. The addition of the second 345-kV circuit would require a 100-ft (30-m) expansion to the existing fence-line.

- The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (SR 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast 4, Section 12, Township 24 South, Range 13 East). The TEP portion of the site is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has already performed preliminary site grading to comply with permitting requirements dictated by the City of Nogales.

- A new 345-kV transmission line would be constructed for a length of an estimated 65.7 mi (106 km). The maximum height of the structures for the 345-kV transmission line would be 140 ft (42.7 m). The length of the new 345-kV transmission line would be an estimated 29.5 mi (47.5 km) on the Coronado National Forest, and an estimated 1.25 mi (2.0 km) on Federal lands managed by the Bureau of Land Management (BLM).

No additional impacts to existing infrastructure would be expected from implementation of the Western Corridor. The proposed transmission line is no greater a terrorist target than any other extra high voltage transmission line in the United States. The worst case terrorist scenario would be that several transmission line poles are felled and that it takes a few days to a couple of weeks to replace them and restring the conductors. The interconnected transmission system is designed with redundancy to accommodate such a situation (TEP 2003).

4.11.1.2 *Central Corridor*

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Central Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 57.1 mi (91.9 km). The length of the new 345-kV transmission line would be an estimated 15.1 mi (24.3 km) on the Coronado National Forest. Options 1 and 2 would have similar impacts.

No additional impacts to existing infrastructure would be expected from implementation of the Central Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.3 *Crossover Corridor*

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Crossover Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 65.2 mi (105 km). The length of the new 345-kV transmission line would be an estimated 29.3 mi (47.2 km) on the Coronado National Forest. Options 1 and 2 would have similar impacts.

No additional impacts to existing infrastructure would be expected from implementation of the Crossover Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.4 *115-kV Interconnection of the Gateway and Valencia Substations*

Construction of the proposed 115-kV Gateway and Valencia Substations interconnection would result in the construction of the new Gateway Substation as described in Section 4.11.1.1 and approximately 3 mi (5 km) of a new 115-kV transmission line. No additional impacts to existing infrastructure would be expected from implementation of the 115-kV interconnection, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no changes to the existing infrastructure in the project area.

4.11.2 Waste Management

4.11.2.1 *Western Corridor*

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials. TEP would implement a Spill Prevention Control and Countermeasures Plan (SPCC) to prevent, control, and minimize impacts from a spill of fuels or other hazardous substances during construction of the transmission line. The following measures would be incorporated into the plan: preventative measures, spill response, and reporting procedures (TEP 2003).

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed of by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite, and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with the manufacturer's recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would not be discharged to the stormwater system but disposed of consistent with manufacturer's recommendations and according to applicable governmental regulations.

Septic wastes generated during construction would be provided for by the use of temporary portable sanitary facilities. Vegetative debris collected during ROW and structure site clearing would be scattered

adjacent to the ROW to create habitat or reduce surface erosion where it would not be considered a potential fire danger.

Operational wastes generated at substations would include minor quantities of municipal solid waste. This waste would usually be paper and plastic wrapping materials from new equipment. No hazardous waste would be generated from substation operation. The amount of wastes generated from construction and operation would be too small to affect the life expectancy of the many municipal solid waste facilities currently operated in the project area, as listed in Section 3.11.2.

4.11.2.2 *Central Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Central Corridor.

4.11.2.3 *Crossover Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Crossover Corridor.

4.11.2.4 *115-kV Interconnection of the Gateway and Valencia Substations*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the 115-kV interconnection.

4.11.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for spills of hazardous materials or wastes from this project to affect local soils or groundwater would be eliminated. Waste management facilities in the area, as described in Section 3.11.2, Waste Management, would continue current operations.

4.12 TRANSPORTATION

This section discusses the potential impacts to transportation in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project. The discussion includes a description of the methodology of analysis and the impacts for each alternative. Because road use, construction, and closure can impact various resource areas, including biological, cultural, visual, geological, and recreational resources, the potential impacts to these resource areas are addressed in their respective impacts sections.

Methodology

The transportation impact analysis includes the potential effects generated by the construction and operation of the proposed project on transportation in the project area. The analysis is based on review of existing transportation in the project area and project access requirements during construction and operation. The analysis of the Coronado National Forest is supplemented by the Roads Analysis (RA) completed for the proposed project, based on data obtained from the U.S. Department of Agriculture Forest Service (USFS), agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). An RA must be completed for any road construction and reconstruction on national forest land, which would be required for all three proposed corridors. The conclusions of the RA are referenced within this Environmental Impact Statement (EIS), both in the transportation impacts section, and in other applicable resource impacts sections. Construction activities represent the principal means by which an impact on transportation (for example, building of new access roads, closing of existing wildcat roads, or traffic disruption) could occur. Impacts to transportation are determined relative to the context of the affected environment described in Section 3.12.

To determine if an action may cause a significant impact, both the context of the proposed project and the intensity of the impact are considered. The context of the proposed project is the locally affected area between Sahuarita and the U.S.-Mexico border, and the significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, a USFS inventoried roadless area [IRA] or special management area), and the degree to which the proposed project may adversely affect such unique characteristics. Impacts would be significant if the proposed project would change the transportation system permanently, or would have extensive short-term effects during construction.

4.12.1 Western Corridor

The proposed project would be constructed over a period of approximately 12 to 18 months. The construction would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. Most workers would come from within Pima and Santa Cruz Counties and would commute on Interstate 19 (I-19) to the three primary points of access: (1) Pima Mine Road in Sahuarita for the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit for the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles (ADOT 2000). The project workforce would add up to 50 vehicles to I-19. Given the temporary and geographically disperse nature of the construction, no significant impact to the existing traffic patterns would be expected and no traffic disruptions on I-19 would occur. Short-term traffic delays may be encountered during construction when the proposed transmission line crosses major roads (such as Arivaca Road). No traffic delays are expected on I-19.

Access to the Western Corridor outside of the Coronado National Forest would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Siting of access roads would be coordinated with the affected property owners and land managers to establish the most appropriate access to the structure sites. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Western Corridor (TEP 2003). On the land managed by the Bureau of Land Management (BLM) west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road, with new 12 ft (3.7 m)-wide access road segments and spur roads to each structure to reduce the area of new disturbance, totaling an estimated 0.9 mi (1.4 km) (an estimated 1.3 acres [0.5 ha] from new access roads and spur roads) in accordance with the Plan of Development (POD) which is being completed concurrently with the EIS. The POD also addresses the revegetation of roads identified to be "retired" following construction, and the gating of roads to prevent off-highway vehicle use. TEP would comply with BLM road closing requirements (TEP 2003).

The U.S Border Patrol's typical operations on the Coronado National Forest between I-19 and Sycamore Canyon are comprised of normal operations and traffic operations on Ruby Road. The majority of the traffic in this area is foot traffic with limited vehicular traffic that exits onto Ruby Road and travels either east to I-19 or west to the town of Ruby and onto Arivaca. The Border Patrol expects an increase in the amount of patrol operations in this area. An increase in vehicular traffic is anticipated with the introduction of a North-South roadway system in the area and preliminary planning stages by the City of Nogales for a road project are underway to construct an East-West road out toward the Pena Blanca Lake area. There would be an increase in the amount of illegal traffic through the west side of the road construction necessary for the proposed project and the increase of Border Patrol resources in the West Desert (USBP 2004).

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Western Corridor, as shown in Figure 3.12–1. Minor spot repairs (such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump) would be required for existing roads including wildcat roads as indicated by the yellow markers on the map. An estimated 95 locations within the Western Corridor would require repair or improvement. Ruby Road and existing wildcat roads would provide some project access as the Western Corridor continues east and joins the El Paso Natural Gas Company (EPNG) pipeline right-of-way (ROW). The new roads that would need to be constructed by TEP for the proposed project are indicated as TEP Proposed Roads in Figure 3.12–1. For the Western Corridor, an estimated 20 mi (32 km) of temporary new roads would be built by TEP for project construction. All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level. Proposed roads would be approximately 12 ft (3.7 m) wide. No proposed roads in the Western Corridor would have a slope of over 30 percent (URS 2003a). Existing classified roads within the Tumacacori EMA would be closed to maintain existing road density.

TEP utilized the following criteria in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project (for more detail, see URS 2003a):

- Use existing roads wherever possible.
- Avoid identified biologically and culturally sensitive areas.

- Avoid sediment transport.
- Minimize erosion potential.
- Avoid areas with water features.
- Avoid prominent topographic features.
- Avoid sensitive viewsheds.
- Facilitate road closure.
- Avoid impacting ranching permittees.
- Comply with maximum road slopes.
- Use the most direct route.
- Facilitate roadway obliteration and restoration.
- Comply with roadway geometry standards such as a minimum turning radius.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. For the Western Corridor, the total new area temporarily disturbed by construction would be an estimated 197 acres (79.7 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Western Corridor, the permanent area disturbed would be an estimated 29.3 acres (11.9 ha). The roads that would remain open for use by TEP (administratively controlled special use roads) following construction would be administratively closed (see Section 4.1, Land Use) (URS 2003a).

Table 4.12–1. Temporary and Permanent Area Disturbed on the Coronado National Forest by the Proposed Project.

	Western Corridor (acres)	Central Corridor (acres)	Crossover Corridor (acres)
New temporary area of disturbance during construction	197	105	238
New permanent area of disturbance	29.3	23.1	36.4

Source: URS 2003a.

As described in Section 3.12, the Forest Plan gives direction to "Limit density of existing and new road construction to one mile of road or less per square mile" (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001). Construction and operation of the proposed project would not affect the road density management plan directives because 1.0 mi (1.6 km) of classified road would be closed for every 1.0 mi (1.6 km) of proposed road to be used in the operation or long-term maintenance of the proposed project. USFS has established principles for identifying high-priority road closure areas including roads within or near specially designated areas (see Figure 3.1–1), roads that cross riparian areas, and wildcat roads.

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers (BLM or USFS) would have boulders, natural impediments, or trenches across the travelway for long-term closure. On the Coronado National Forest, portions of the roadbed would be ripped, obliterated, and reseeded/revegetated in consultation with USFS, especially in the initial visible portion of the roadway to effectively obscure signs of the roadway. To the extent that remnants of closed roadways remain, these could be used by illegal immigrants although they would not provide a single continuous pathway from the U.S.-Mexico border. In addition, illegal immigrants may leave trash and waste behind as they pass through an area (House 2002). Revegetation would be limited to species found in the particular biome. Transmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.2 Central Corridor

The Central Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Central Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the Central Corridor would be on existing utility maintenance roads (for example, access to the EPNG pipeline ROW) which would require extensive upgrades, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Central Corridor for either Option 1 or 2 (TEP 2003).

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and existing unclassified roads would provide access to portions of the Central Corridor, as shown in Figure 3.12–1. For Option 1, an estimated 15 locations within the Central Corridor would require repair or improvement. For Option 1, an estimated 13.8 mi (22.2 km) of temporary new roads would be built by TEP for project construction. For Option 2, the existing EPNG pipeline roads would provide access to the transmission line structures. Consequently, minimal road construction would be required within the existing IRA. Upgrades to the existing EPNG pipeline roads and other existing access roads would be required, and would disturb approximately 2.6 acres (1.0 ha) of land. Approximately 0.20 miles (0.34 km) of spurs from existing roads would be constructed within the IRA, disturbing approximately 0.30 acres (0.12 ha). All proposed roads to structure sites would be consistent with the Forest Plan, as described for the Western Corridor. An estimated 1 percent of the total mileage of the proposed roads in the Central Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards. For the Central Corridor, the total new area temporarily disturbed by construction would be an estimated 105 acres (42.5 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber optic splicing sites. For the Central Corridor, the permanent area disturbed

would be an estimated 23.1 acres (9.3 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched within an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western CorridorTransmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.3 Crossover Corridor

The Crossover Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Crossover Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the currently anticipated alignment of the ROW within the Crossover Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor.

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Crossover Corridor, as shown in Figure 3.12–1. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. Helicopter access would be used to bring in 20 to 25 structures in this segment as described in Section 2.2.4. For Option 2, the existing EPNG pipeline roads would provide access to the transmission line structures. Consequently, minimal road construction would be required within the existing IRA. Upgrades to the existing EPNG pipeline roads and other existing access roads would be required, and would disturb approximately 2.6 acres (1.0 ha) of land. Approximately 0.20 miles (0.34 km) of spurs from existing roads would be constructed within the IRA, disturbing approximately 0.30 acres (0.12 ha). Minor spot repairs would be required for existing roads, including wildcat roads, as indicated by the yellow markers on the map. An estimated 98 locations within the Crossover Corridor would require repair or improvement. For the Crossover Corridor, an estimated 20.7 mi (33.3 km) of temporary new roads would be built by TEP for project construction.

All proposed roads to structure sites would be consistent with the Forest Plan, and would be classified as closed special use roads. Roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to no higher than Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level. An estimated 2 percent of the total mileage of the proposed roads in the Crossover Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber-optic splicing sites, and laydown construction yards. For the Crossover Corridor, the total new area temporarily disturbed by construction would be an estimated 238 acres (96.3 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support

structures and roads to fiber-optic splicing sites. For the Crossover Corridor, the permanent area disturbed would be an estimated 36.4 acres (14.7 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched with an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western Corridor.

4.12.4 115-kV Interconnection of the Gateway and Valencia Substations

The proposed 115-kV transmission line would cross SR 189 (Mariposa Road) and I-19. Construction of the proposed interconnection may result in temporary traffic disruptions and road closures along these transportation corridors. Construction activities may also disrupt traffic patterns and flow along smaller local roadways. Because of the short duration of construction (approximately 45 days), the impacts on transportation would be minimal.

4.12.5 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no transportation impacts associated with the No Action Alternative. Current traffic patterns and growth of unclassified roads on the Coronado National Forest would be expected to continue.

4.13 ENVIRONMENTAL JUSTICE

In Section 3.13, the DOE identified the minority and low-income populations in the project area pursuant to Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994). This section discusses the potential for environmental justice impacts to those populations.

Methodology

Environmental justice impacts can result if the proposed activities cause disproportionately high and adverse human health or environmental effects to minority or low-income populations. DOE assesses three factors to the extent practicable to identify disproportionately high and adverse environmental effects:

Whether there would be an impact on the natural or physical environment that significantly and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment.

Whether environmental effects would be significant and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.

Whether such environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

4.13.1 Western, Central, Crossover Corridors and 115-kV Interconnection

As shown in Section 3.13.1, five of the census block groups intersected by the Central Corridor, and six of the census block groups intersected by the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage. Also, one of the ten census block groups intersected by the proposed corridors (where the corridors are common) exceeds the low-income population threshold. As shown in Figures 3.13–1 and 3.13–2, the census block groups that *would be* intersected by the proposed corridors are of a similar composition to those that *would not be* intersected by the proposed corridors (that is, the corridors do not pass through concentrated pockets of low-income or minority populations). Nonetheless, the following describes the potential environmental impacts of the proposed project in terms of any special circumstances or mechanisms through which low-income or minority populations may experience disproportionately high and adverse human health or environmental effects.

The main environmental impacts to minority and low-income residents within the proposed project area would be in the form of changes to the visual setting from the presence of the transmission line and supporting towers, and impacts to recreational resources. The area evaluated for potential effects on visual and recreational resources is the entire area (and viewshed) of the valleys and mountains from Tucson to Nogales, Arizona. Although a few residential areas in Sahuarita, Nogales, Amado, and Tubac would experience a change in visual setting, great parts of the corridors would run through uninhabited areas or would not be visible from residential or recreational areas. Some residences near Sahuarita and Nogales would experience a change in foreground (within 0.5 mi [0.8 km]) visual setting under any of the alternatives, while some residences near Amado and Tubac would experience a change in foreground visual setting for the Central Corridor only. The residences located further away from the proposed transmission line would likely experience less visual impact as the degree of discernible detail decreases with distance.

DOE has not attempted to quantify the visual impacts because of their subjective nature, and because they are likely to differ from one person to another as they each would view the proposed transmission line from their own vantage point.

The Coronado National Forest and trails and unpaved roads outside of the national forest lands provide recreational opportunities. The transmission line may impact recreational resources in the area of the corridor by disturbing the visual setting over the long term. Construction of the transmission line may cause temporary impacts to recreational resources, such as road closures. However, these impacts would be of short duration in any one location, and recreational resources are used by both the general population and low-income and minority residents.

Neither DOE nor its cooperating agencies are aware of any special circumstance that would disproportionately impact minority or low-income populations, such as unique exposure pathways or practices among the minority or low-income populations, or food gathering practices specific to low-income or minority populations.

The proposed project is within the traditional territories of several Native American tribes. DOE initiated formal government-to-government consultation in a letter sent to tribal governments of the 12 Native American tribes that have traditional connections to the area. Seven of the 12 tribes contacted have expressed objections to the proposed project.

Long-term electric and magnetic field (EMF) exposure from the proposed transmission line to the nearest residences, schools, and commercial establishment would be well below 0.8 milliGauss (mG) per day, which is equivalent to the average daily exposure to maximum magnetic fields from some common household appliances (see Table 3.10–1 for a list of EMF levels of some common household appliances). Therefore, the surrounding population would not be impacted by EMF exposure, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

The population in the regional airshed of southern Arizona would not be impacted by the temporary increase in air pollutant emissions during construction, and no mechanisms have been identified for minority or low-income population to be disproportionately affected during construction or operation of the project.

The potential noise impacts of the construction and operation of the proposed corridor alternatives would create annoyance primarily to the residents nearest to the right-of-way (ROW) during the construction period. The noise levels would be temporary and intermittent, and no construction would occur between the hours of 10 p.m. and 7 a.m. Therefore, the surrounding population would not be impacted by the noise generated from the proposed project, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

On the basis of the foregoing discussion, DOE concludes that no disproportionately high and adverse impacts, for the resource areas discussed above, would be expected for minority or low-income populations.

For all other resource areas (that is, land use, socioeconomics, biology, geology and soils, water resources, infrastructure, and transportation), DOE concludes that, because the proposed corridor alternatives would be purposely sited away from residential areas and in sparsely populated areas in order to avoid impact on large numbers of residences, no potential for disproportionately high and adverse impacts among minority or low-income populations would be expected.

The potential for cumulative impacts to minority or low-income populations from the proposed project in combination with other past, present, and reasonably foreseeable future actions is addressed in Chapter 5, Cumulative Impacts.

4.13.2 No Action Alternative

Under the No Action Alternative, Tucson Electric Power Company (TEP) would not build the proposed transmission line and the associated facilities as proposed in the Environmental Impact Statement (EIS). Santa Cruz County would continue to experience unreliable electric supply. Unreliable electric supply has the potential to cause health and safety impacts. However, these adverse impacts of No Action would not be experienced disproportionately by minority and low-income populations in the affected area.